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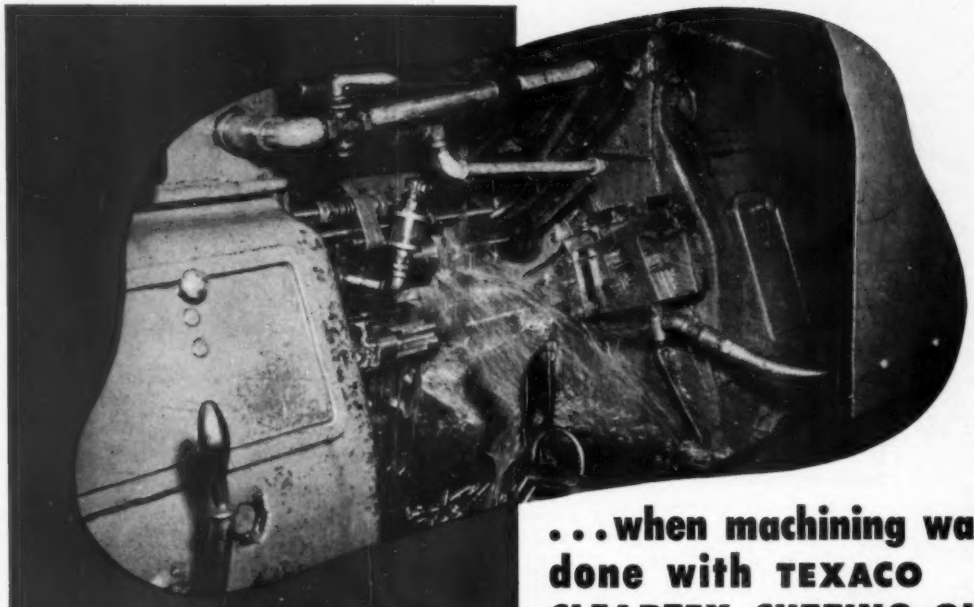

130% GREATER PRODUCTION between tool grinds...

...when machining was done with TEXACO CLEARTEX CUTTING OIL

In this plant,* steel parts for pumps were being machined on Acme Gridley automatics. Two different competitive oils were being used – one as cutting fluid and the other as machine lubricant. Production lagged because of frequent tool changes, and contamination of coolant by machine oil necessitated frequent oil changes.

Then a Texaco Lubrication Engineer was asked what could be done to speed up production. He recommended using *Texaco Cleartex Cutting Oil B* as both coolant and machine lubricant. One oil thus replaced two; contamination problems and oil wastage were eliminated – and *production between tool grinds immediately jumped 130%!*

Machining stainless steel on the same set-up, use of *Texaco Cleartex Cutting Oil B* increased production between tool grinds 42%.

Let a Texaco Lubrication Engineer specializing in metal working help you gain increased production and lower unit costs in *your* plant. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to help you do every machining job better, faster and at lower cost.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

**Name of this Texaco user on request*

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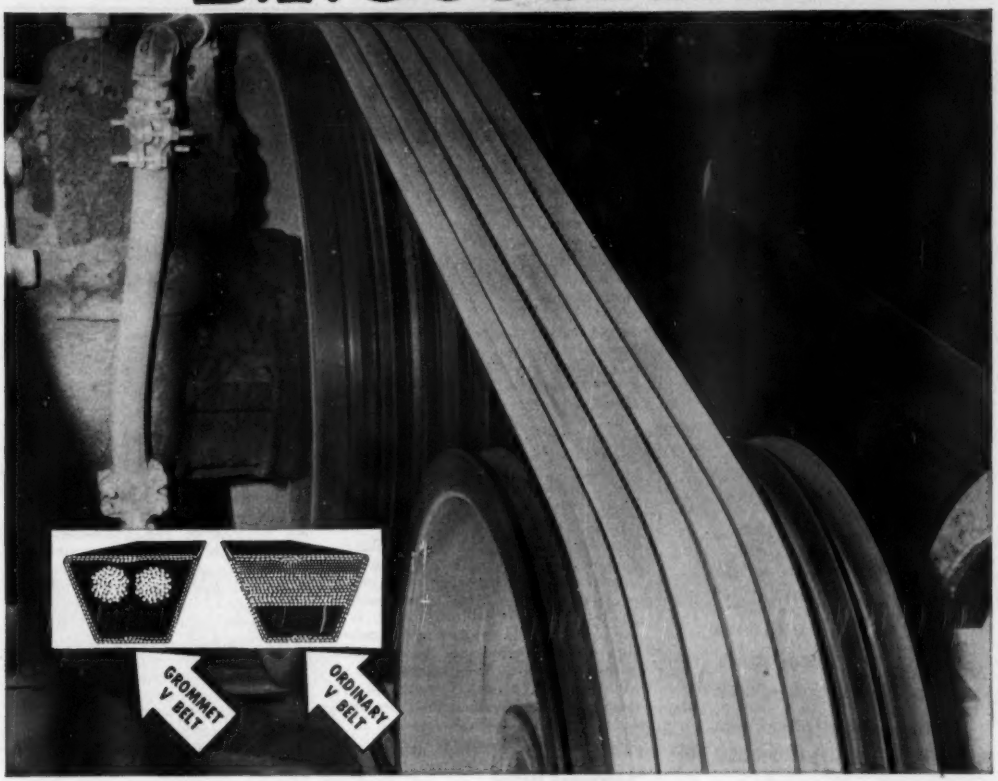
TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Five grommet V belts doing the work of 8

B. F. Goodrich grommet V belts cut costs 20 to 50%

THIS is actually an 8-belt drive but a plant accident damaged three of the belts and the engineers decided to let the remaining five belts run and see what happened. They've done the job perfectly because they're B. F. Goodrich grommet V belts — here's where that extra strength comes from:

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet! — No other multiple-V belt is a grommet V belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY

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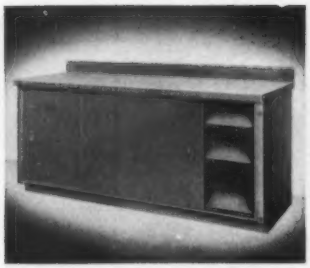

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'ROUND ABOUT with the editors in field and office

Industry Offers a Post-Graduate Course for Professors

At the Second Industry-College Conference at the Case Institute of Technology, Granville M. Read, chief engineer of du Pont, expressed a belief that professors in engineering schools should spend a year in industry.

Furthermore, he made a concrete offer to provide places for some of them in du Pont Engineering Department proposing "Giving them 12 mo experience throughout our entire engineering organization. We will pay them their regular salary plus reasonable expenses. This is no Santa Claus proposition. It is a sincere and earnest effort toward a practical way to further better understanding for our mutual benefits."

Continuing, he pointed that today an engineer has many fields in which to practice his chosen specialty, but that his training would be a lot more valuable if those who teach him were aware of the viewpoints and problems of industry.

In the face of a great surge of specialization, Mr. Read declared: "There is an even more urgent need for broad gauge executive leaders with vision and a goodly quantity of the humanities. It is my belief that the key to quality leadership for our nation and its industries is in the hands of our colleges, but to use this key successfully our colleges must clearly understand their problem, not as it used to be but what it is today and will be tomorrow."

Personnel Notes of Plant Engineering Changes

Allen L. Thompson, formerly plant engineer of the Catholic University of America, Washington, D. C., is now engineer of the D. C. Main Pumping Plant in the same city. He has been succeeded at Catholic University by James Walden. M. C. Engel is plant engineer at American Cyanamid Co., Latrobe, Pa. George Jonah was recently appointed plant engineer of H. P. Hood & Sons, Lynn, Mass. G. O. Hainer is plant engineer of the Morton Salt Co. at Newark, Cal.

R. N. Eighbauer, Project Engineer, Niagara Chemical Div., Food Machinery Corp., Middleport, N. Y., advises that A. J. Van Fleet, formerly plant engineer, is now with the Comstock Canning Co., Newark, N. Y. T. Dorsey Jones is plant engineer of the Spiegel Furniture Co., Plant B. Shelbyville, Ohio.

Charles Martin, formerly plant engineer, Manufacturers Battery Co., Lancaster, Ohio, has resigned. L. C. Goodman is manager. Whitney Grant was recently appointed plant engineer, Vilter Mfg. Co., Milwaukee, Wis., to fill the vacancy left by the resignation of Art Kumm. At Monsanto Chemical's Mound Laboratory, Miamisburg, O., Robert Shiffer is plant engineer. R. M. Veatch is plant engineer at the Cooper-Bessemer Corp. plant at Grove City, Pa.

Professional Standing Depends Upon Performance Not Claims

There is no Royal Road to fame and the following remarks set forth very clearly the responsibility of the individual both to himself and to the profession to which he belongs. The following remarks, made by L. G. Northcroft, past president of the Incorporated Plant Engineers of England, and published in the November-December issue of the Society Journal, are timely and pertinent.

"Many engineers who have risen to the heights of the profession have started with nothing more than an ambition to succeed. They have educated themselves both technically and practically as they went along. They have never grumbled about status because they have made their own.

"But not every man who is now a plant engineer is capable of rising. In general terms this is because: he has not developed power of self-expression so that whatever good ideas he has remain locked up in himself; he has not developed an understanding of the economics of plant engineering so that he cannot translate his technical knowledge into pounds, shillings and pence to lay before a board of directors; and he has not always had either the inclination or the opportunity for mixing with his fellows and keeping up-to-date with technical progress.

"The Institution cannot claim increased status either for itself or for its members unless both the Institution and the members have earned it because status is not given, it is earned. This fundamental point must always be remembered.

"What the Institution can do is to provide opportunities for its members to increase their abilities. For example, in the matter of self-expression members should realize that an active participation in the reading of papers or in the discussions at branch meetings is one of the finest ways of improving themselves.

"The winning of a prize is a minor gain to what will be achieved by putting down your thoughts on your own spe-

(Continued on page 138)

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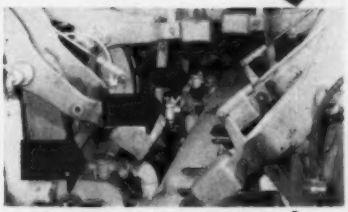

SAVES 14 TONS COAL MONTHLY... that's the profitable result of changing over to Armstrong Traps . . . *M. Wile and Company, Buffalo, N. Y.*

2-3 HOURS FASTER HEAT-UP... starch drier takes new lease on life after Armstrong Unit Trapping... *Industrial Grain Products, Ltd., Fort Williams, Ontario*

40° TEMPERATURE RISE... pyrometer readings on flatwork ironer rolls prove performance of Armstrong Unit Trapping . . . *Peter Bent Brigham Hospital, Boston, Mass.*

IT IS false economy to drain more than one coil, kettle, unit heater or other steam-consuming unit with a single trap. In the first place a single trap for several units must be larger and higher priced than the individual trap on *each* unit, so the difference in original cost is not as great as it might first appear. But the difference in performance can be *tremendous.* The slightest difference in condensing rate between two units will cause a difference in steam pressures between the units. Even a few ounces pressure difference will hamper drainage of condensate and, most important, will prevent or retard flow of air from the lower pressure unit. The result is widely varying and subnormal temperatures, less heat output, slower heat-up, less production and higher operating costs.

Don't be penny wise and pound foolish. Install a trouble-free Armstrong trap on each steam-consuming unit in your plant. Call your Armstrong Representative today.

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SEND FOR THE STEAM TRAP BOOK —

SEE OUR CATALOG IN SWEET'S or C&C

36 pages of practical data on selection, installation and maintenance of traps. Yours for the asking.

ARMSTRONG STEAM TRAPS

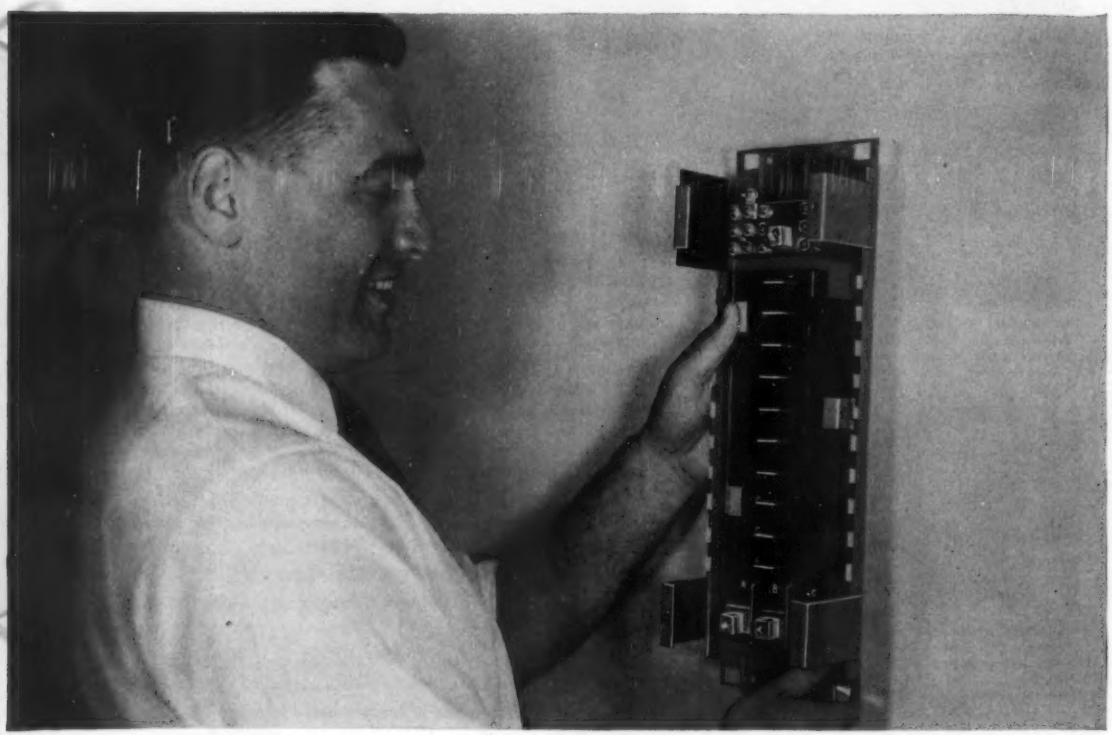
INTRODUCING A PANELBOARD WITH A PLASTISOL HEART

Now—for the first time—a new insulating material, Plastisol, is used as the heart of a complete line of panelboards.

The interior of Trumbull's new NLTQ Panelboard is formed with bus bars *molded in* a plastisol base. This plastisol material has many advantages over all other types of insulation: highly resistant to either acid or alkali; no harmful aging; no shrinking or embrittlement; highly resistant to tracking and carbonizing; will withstand temperatures of 212 F without harm; has very high thermal conductivity (even at minus 30 F) and is an excellent radiator of heat. Tests show copper bus bars encased in plastisol run 10% cooler than in open air!

Trumbull's plastisol base is Underwriters' Laboratories, Inc. approved, and is completely endorsed by The Electrical Council.

The NLTQ Panelboard is furnished with lug-in mains or circuit breaker mains in capacities up to 225 ampere bus bars, in a range of 4 to 42 circuits. 3-wire, 120/240 volt A-C or 4-wire, 3-phase, 120/208 volt A-C, solid neutral. Provision can be made for increasing any bus capacity up to 210 amperes; also sub-feed, meter loop, through feed and split bus. ***Write for Bulletin TEB-14.***



NEW INTERIOR SAVES INSTALLATION TIME, PROVIDES SEQUENCE PHASING

The interior is compact, allowing ample room for wiring. As shown in the picture at the right, it is mounted in the box by means of four posts and compression springs; this speeds installation, permits removal for ease in wiring.

The bus bar and stab assembly is silver-plated copper for positive conductivity. Line terminals are heavy-duty, silver-plated, solderless.

Another unique feature of this interior is that by ingenious design, sequence phasing is built into the Panelboard. Each adjacent Breaker is on an alternate phase, which assures balanced loads and circuits.

Phases are permanently identified by molded-in letters.

You've never before seen a CIRCUIT BREAKER like this in a panelboard

QUICK-MAKE, QUICK-BREAK Trumbull's new TQL interrupts with a *snap*. No matter how sloppily the handle is operated, the movable contact arm (A) opens or closes *fast* and *clean*... reduces burning or arcing of contacts.

DOUBLE PROTECTION *thermal and magnetic* Trumbull's new TQL trips automatically by (B) time-delay thermal action of excessive overload (but not by harmless temporary overloads) or by (C) instantaneous magnetic action for short circuit.

TRIP-INDICATING When an overload or short circuit causes the Breaker to trip, the handle (D) moves to mid-position between OFF and ON where it is easily observed from a distance.

TRIP-FREE Trumbull's new TQL Breaker automatically trips independently of the handle—it trips for a fault condition even though handle is held in ON position.

OTHER FEATURES Pressure-type silver-plated copper contacts (E)... arc chute (F) made of special refractory material . . . exhaust chamber (G) to cool gases . . . completely tamper-proof . . . Underwriters' Laboratories Inc. approved.

INTERCHANGEABLE All ampere ratings are physically interchangeable.

RATINGS 15, 20, 30, 40, 50 amp; 120 volt A-C, single pole, single throw. Interrupting: 5000 amp. 120 volt A-C, 120/240 volt A-C. Two-pole operation, independent trip, possible with handle extensions.

COMPRESSION SPRINGS save nuisance of nuts and washers, allow fronts to be lined up regardless of uneven box installation.

ONE-PIECE WELDED ASSEMBLY of front and barrier saves installation time. Front is attached to interior by means of four screws.

COMPLETELY PROTECTED With door locked, screws are concealed, front cannot be removed. Note attractive appearance; invisible hinges.

TRUMBULL (T) ELECTRIC

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY

PLAINVILLE, CONN.

Take a whale of a bite out of power costs!

V-Belts by

put cost-cutting teeth in your V-Belt drives with DAYTON COG-BELTS

40% MORE H.P. PER BELT — **FEWER BELTS**

FEWER PULLEY GROOVES — **LONGER BELT LIFE**

There's a whale of a saving in power transmission costs when you use the premium Dayton Cog-Belt! It delivers 40% more h.p. than an ordinary V-Belt. Here's why—

Cog-Belts are built to bend—like your finger—to take up compression strains as the belt goes round the pulleys. Results: Less strain, less heat, less stretch, less maintenance, longer life, less down-time.

Save on the cost of original belting! You need fewer belts, fewer pulley grooves to do the job, when 5 Dayton Cog-Belts do the work of 7 ordinary V-Belts,—and do it better!

Save drive-space, plant space! Cogs permit much shorter center-to-center distances—up to 25% shorter. They save up to 47.2% in drive area.

To end your V-Belt troubles for the long "duration" ahead, give your Dayton Distributor the "high-sign" of better V-Belt power transmission: the arched finger that means Dayton Cog-Belts and important savings!

*T.M.

DAYTON RUBBER COMPANY • DAYTON 1, OHIO

TAKE A TIP FROM A TIPPLE

14 years ago a set of Dayton Cog-Belts went to work, running the tipple at a coal mine at Logan, W. Va. These same veteran Cogs are still on the job! The mine superintendent predicts that they are good for years to come. If you have a drive that's a real toughie, turn it over to a team of Dayton Cog-Belts, for a long, trouble-free life!

Dayton Rubber

WORLD'S LARGEST MANUFACTURER OF V-BELTS

DISCHARGED FROM ACTIVE DUTY

When the '1000' VALVE Goes on the Job . . . . These Troublemakers are THROUGH . . .

CASH STANDARD *Streamlined* PRESSURE REDUCING VALVE TYPE 1000

What this user says IS PROOF:

"The type '1000' valves we have in our plant are used on our heating system and washers and degreasers. Our heating system is almost entirely unit heaters and with varying conditions, the valves are called on to operate at both small capacities and wide open. When the wind is mild the valves are practically dead ended and when the weather is cold, the valves are called on to open and close very rapidly. On our washers and degreasers we don't have anything else but the Cash type '1000'. Our oldest valves in the plant are seven years old, but they are working perfectly."

WRITE FOR BULLETIN 962

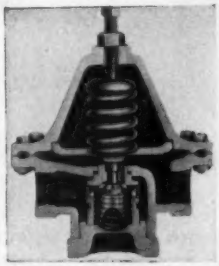
ITS ASPIRATOR AND STREAMLINED FLOW WORK TO YOUR BENEFIT IN THESE 12 WAYS . . .

1. Maximum Capacity when needed most. 2. Accurate Pressure Control under toughest working conditions. 3. Trouble-free Service. 4. Smooth Operation. 5. Tight Closure. 6. Accurate Regulation. 7. Speedier Production Results. 8. Elimination of Failures. 9. Constant Delivery Pressure. 10. Cost Saving Operation. 11. No Spoilage. 12. Practically zero in maintenance costs.

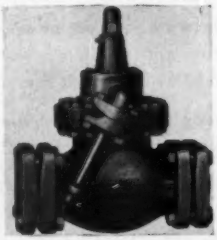
CASH STANDARD CONTROLS . . . VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

These Fenestra Windows in the American Woolen Co., Lawrence, Mass., were commercially hot-dip galvanized and installed in 1922. They are still in fine shape.

NOW MADE EVEN MORE DURABLE!

Over the long years you've seen the loyal performance of Fenestra* Steel Windows. You've seen the ruggedness of fine steel minimize most maintenance . . . the strength and rigidity stand up under years of use. You've seen the fine protection that commercial galvanizing gives steel.

And now Fenestra's *special* galvanizing makes Fenestra Windows even *more* durable.

We call it *special* galvanizing because it's unobtainable anywhere else. Fenestra engineers developed a galvanizing system specifically for Steel Windows and built a special plant around it.

THE REAL SECRET

The real secret of the system is that Fenestra galvanizing is an integral part of the *manufacturing process.*

So get steel-strong windows made to *stay* new—get Fenestra Galvanized Steel Windows. For further information, call your Fenestra Representative (he's listed in the yellow pages of your phone book). Detroit Steel Products Company, Dept. PE-3, 2280 East Grand Boulevard, Detroit 11, Michigan. *®

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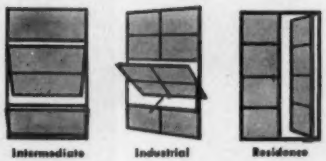
2. **Hot, Deep-Dip Galvanizing.** Windows are cleaned, rinsed, fluxed, then *completely* immersed in a bath of molten zinc.
3. **Bonderized Finish.** For a perfect finish, windows are Bonderized, then rinsed. Also provides excellent base for paint finish when desired.

Steel-Strong Windows made to STAY new

Fenestra

HOT-DIP GALVANIZED STEEL WINDOWS



----------take this view----------

Of Your Plant's Electrical System

Distributing electrical power to operate your plant is more than just wiring between transformers and equipment.

The electrical distribution system's flexibility, service continuity, regulation, and efficiency can have a decided effect on your operating economy. There is no all-purpose system to balance these factors . . . to best meet all your needs. That's why it's imperative that your plant have a modern distribution system specifically planned to meet *your* individual requirements.

Power centers provide the simplest way—the low-cost way—of attaining the system you require. Westinghouse Indoor Dry-Type Power Centers also give you these advantages:

THEY COST LESS TO MAINTAIN—no liquids to test, recondition or replace . . . no gaskets, valves or gauges. All parts are readily accessible.

THEY'RE MORE ECONOMICAL—because they eliminate the need for costly vaults and can be located near center of load . . . resulting in shorter secondary circuits, lower line losses, better regulation.

THEY'RE SAFER—from the hazards of fire and explosion; they have no exposed live parts. Breakers and switches have positive interlocking mechanisms, each in its separate compartment.

Your Westinghouse Representative will be glad to discuss your system problems with you. He is prepared to offer complete system information, with advantages of each carefully weighed. Ask him for Booklet B-4045, *"Industrial Plant Distribution Systems"*, B-4162, *"Power Centers by Westinghouse"*. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60731

PRIMARY SELECTIVE RADIAL SYSTEM

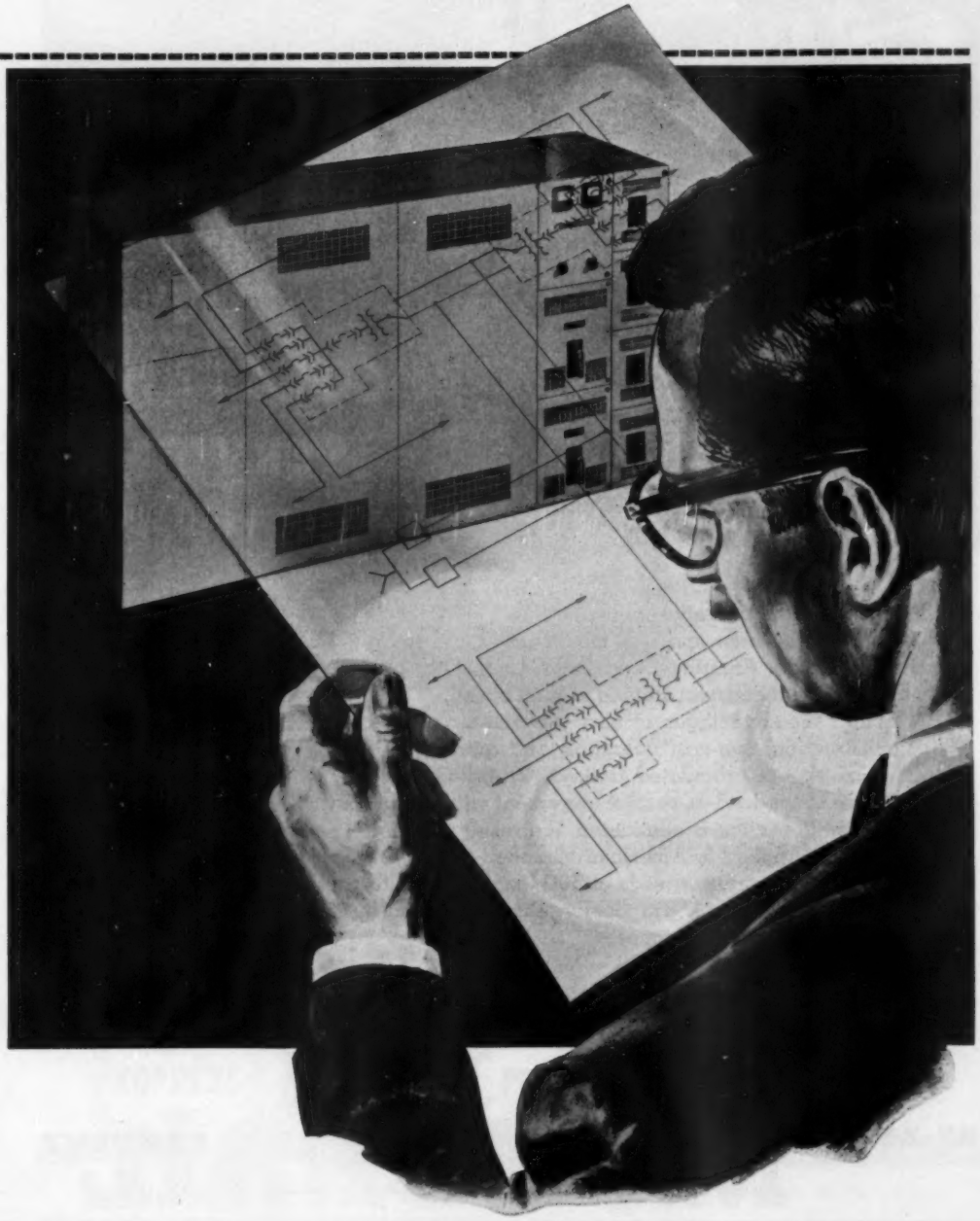
Low operating and maintenance costs, with moderate initial expense, make this system excellent for installations where the requirements for flexibility, and service continuity are average. To evaluate this system in terms of your requirements, consult your Westinghouse Representative.

Westinghouse

POWER CENTERS

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



HERE'S THE CRANE FOR

CONSTANT SERVICE *at* HIGH SPEED

If your handling operations must be "on the go all the time and fast, too", then investigate this American MonoRail Crane. Coupled with constant service at high speed, it offers the advantages of easy movement, rugged construction, low-cost operation and quick installation. But the No. 1 advantage is articulated trolleys. When each trolley wheel carries its share of the load in perfect alignment with the craneway tracks and all possible friction is eliminated, the result is perfectly articulated trolley travel. Applied to American MonoRail Cranes, these articulated trolleys permit operating speeds of 500 feet per minute and constant service. Breakdowns are practically eliminated and the crane is ready for fast service at all times.

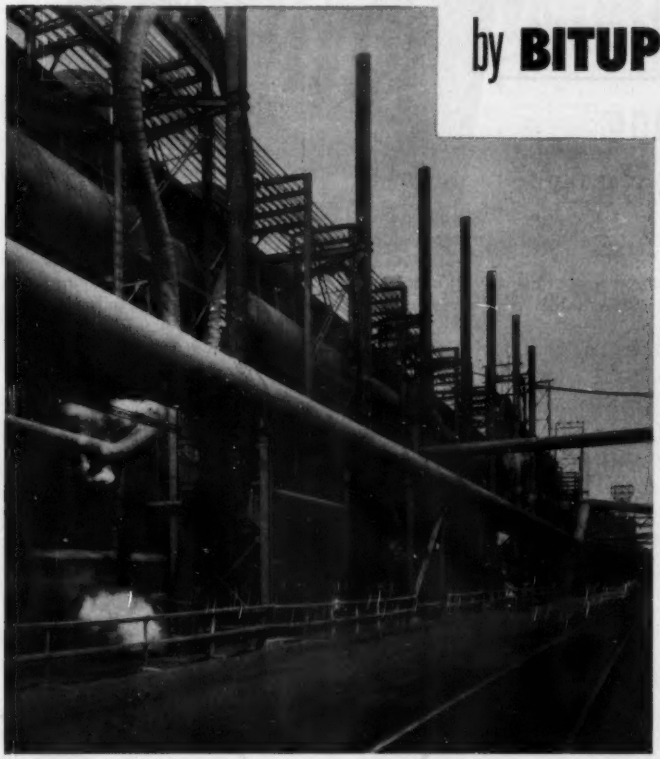
An American MonoRail engineer will gladly give you all the details, or write us about the American MonoRail Constant-Service High-Speed Crane.

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE **CLEVELAND 7, OHIO**

Large Steel Plant Protected Against Corrosion

by BITUPLASTIC® No. 28



SEVERE corrosive atmospheres around these big blast furnaces are a challenge to *any* protective coating. Bituplastic No. 28, a heavy-duty Koppers Coating, has met this challenge . . . with plenty to spare.

Here's one of the reasons: each coat of Bituplastic No. 28 protects metal with a thick, tough film—a film that is *five to eight times thicker* than conventional protective coatings. This extra-thick, extra-tough barrier against corrosion provides better protection, lasts longer, and costs far less to maintain.

Bituplastic No. 28 is one of Koppers complete family of Bitumastic® Industrial Protective Coatings—specially formulated to control specific kinds of corrosion. Send for a set of our free booklets. They show how Koppers Coatings can cut *your* corrosion losses.

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- **Koppers Coatings, unlike maintenance paints, are specially formulated from a tar-pitch base* that is, for all practical purposes, impervious to water.**
- **Koppers Coatings provide a tough, impenetrable barrier to corrosive elements.**
- **Koppers Coatings provide up to 8 times the film thickness of conventional paint coatings.**
- **Koppers Coatings stop corrosion caused by moisture . . . acid fumes . . . alkaline fumes . . . corrosive soil . . . salt air . . . heat.**

**Hi-Heat Gray contains heat-resistant metallic base*

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An extra quality, exceptionally rugged hose for toughest use on air drill and pneumatic service in mines, quarries and construction jobs. Non-porous tube resists heat and oil. High tensile cotton yarn braid reinforce carcass. Tough grey cover resists cutting, gouging, abrasion. 7 sizes from ½" 2-braid through 2" 3-braid. 200 to 300 lbs. working pressure. Maximum length 50'.

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For heavy construction work in mines, quarries, tunnels and wherever large size hose is required for long service. Smooth black tube resists heat and oil. Carcass of strong, rubber-impregnated multiple ply woven duck. Rugged, heavy-gauge red rubber cover resists severe weather extremes, cutting, abrasion. 9 sizes stocked from ½" to 4". Working pressures from 175 to 225 lbs. Maximum length 50'.

AUROCHS AIR

For portable air compressors, jackhammers, rugged industrial and construction work. Smooth, black, non-porous tube resists heat and oil. Carcass: multiple ply, rubber-impregnated, rugged woven fabric. Tough black cover resists weather and abrasion. Stocked sizes: ½", ¾", 1". 200 lbs. working pressure. Maximum length 50'.

TIGER AIR

Lightweight, flexible hose for general industrial and medium air service. Smooth black tube resists oil and heat. Carcass is strong, lightweight multiple ply woven fabric. Tough, black cover resists abrasion. Stocked sizes: 5/16", ½", ¾". 150 lbs. working pressure. Maximum length 50'.

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For general industrial use, on compressors and pneumatic tools. Black tube resists oil and heat. Husky cotton yarn braids. Smooth, red cover resists weather, abrasion. 8 sizes stocked, ¼" 2-braid to 1" 3-braid. Working pressures 150 to 225 lbs. Maximum length 500'.

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For a variety of jobs including handling of air, water, oil, gasoline, kerosene (not for paints, lacquers, lacquer-solvents). Black, synthetic tube resists oil and heat. Carcass is braided rayon cord, high strength, super flexible. Smooth, brown, tough synthetic cover resists oil, abrasion, sunlight. 11 sizes stocked from 3/16" one-braid to 1" 2-braid. Working pressures: 200 to 300 lbs. Maximum length approximately 500'.

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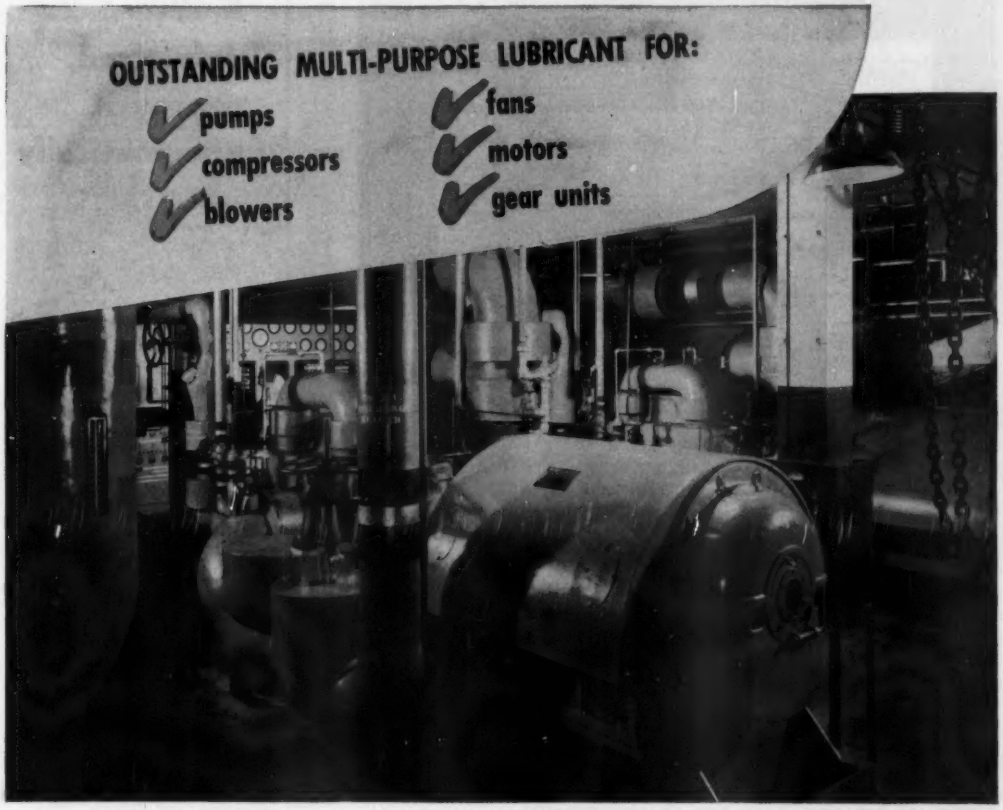

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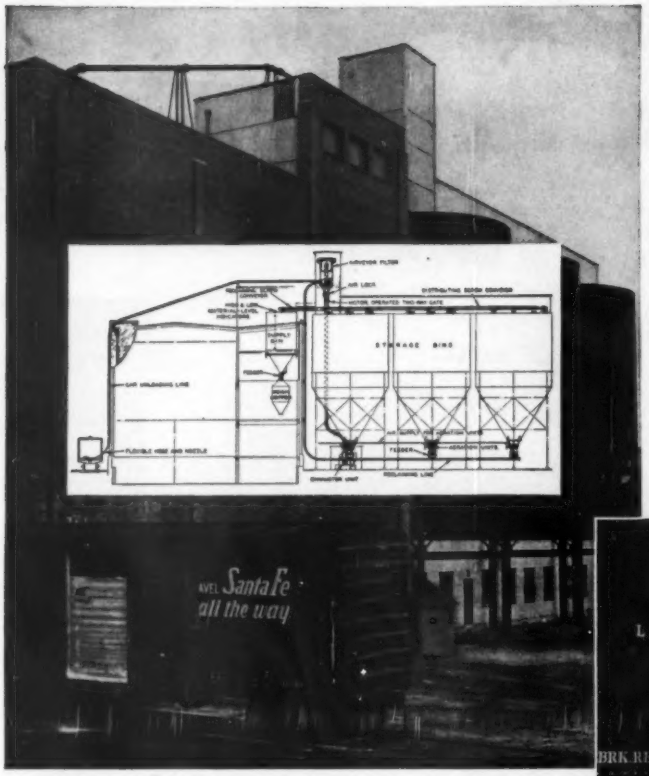

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The AIRVEYOR goes to work for the New York & Pennsylvania Company

Problem: To install a conveying system for coating clay that would match the efficiency of the expanded and modernized plant at Lock Haven.

Solution: Pulverized coating clay, with a moisture content of not over 3 per cent, is pneumatically unloaded from box cars and conveyed to the Airveyor filter for delivery to any one of three storage bins, or direct to a supply bin above a weigh hopper. Unloading rate is 10 tons an hour. The same system reclaims clay from the storage bins and delivers it to the supply bin—by remote control from a centrally located panel board. Provision is made for automatic return of clay to the storage bin, from which it is being conveyed, when the supply bin is full, or to any bin in any sequence when unloading from cars.

If handling of dry, pulverized materials is a major problem to you, look to Fuller for the most economical and practical solution. Fuller specializes in pneumatic methods of materials handling. Today, the Airveyor, and other Fuller Systems, are cutting handling costs, and materially increasing operating efficiency in hundreds of installations. To have a Fuller Engineer survey your present system and make recommendations for modifications places you under no obligation whatever. It's more than likely that the results of his study will point your way to more efficient materials handling at lower operating and maintenance costs.

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DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—
COMPRESSORS AND VACUUM PUMPS—
FEEDERS AND ASSOCIATED EQUIPMENT

A-112

BULLETINS just released and of immediate plant interest

CONSTRUCTION AND MAINTENANCE

101 Corrugated Plexiglas and Where to Use It—Booklet PL-78 a 24-pp brochure describing uses of corrugated Plexiglas presents 19 photographic case histories showing how this acrylic plastic sheet can be used in interior architecture, in institutional and commercial lighting, and as glazing. A section is devoted to typical installation-detail drawings for attaching Plexiglas to itself and to other flat, shaped and corrugated materials. Fabrication techniques listed include cutting, drilling, polishing and cementing. Also included are types, colors, sizes, thicknesses of Plexiglas sheets with a tabulation of physical properties. Plastics Dept., Rohm & Haas Co.

102 Steel Flooring and Armoring—Sixteen-pp Bulletin 1103 discusses different types of company's Tri-Lok open steel flooring and safety treads. Contains specification data, safe load tables, installation methods and other helpful information. Also included is a description of floor armoring and T-Tri-Lok flooring, the latter an assembly of tee bars which, when filled with concrete, is used instead of heavier floorings to reduce dead load and permit lighter weight superstructure. Fully illustrated. Machinery Div., Dravo Corp.

103 Improved Insulation—Bulletin 9-0 introduces company's improved Thermalite 85 per cent Magnesia insulation. Discusses its thicknesses, conductivity, uniformity and durability. Gives data on dimensions, available forms. Ehret Magnesia Mfg. Co.

104 Dome Skylight Units—Here's a bulletin on pre-fabricated dome skylight units of Plexiglas, ready to drop in place. Pictures easy installation, gives standard sizes, construction details, specifications. Price list included. Wasco Flashing Co.

105 For Better Surface Protection—This is a recently published collection of test data and application information on company's new Tinallium Pro-Tex-It, a non-drying, paste-type preservative developed for use on all metals, woods and concrete mixes for protection against weathering conditions, acids, alkalis, fumes, chemicals and other destructive agents. Discusses fire-resistance, non-staining and non-toxic qualities, other features. American Sand-Banum Co., Inc.

106 Fastening Tips—This recent issue of company's house organ relates some interesting case histories on the use of company's fastening system. Tells how it was used to fasten oak planks to steel beams on a bridge repair job, to anchor steel floor plates in a rubber plant, and to speed construction work at an airport. Also describes a new safety shield and dual-action tool. Ramset Fasteners, Inc.

107 Surfacing for Plant Floors—Bulletin L-3734, 2 pp, describes in detail and illustrates the Pak-Tamp application process for surfacing and repairing, stressing how factory floors can be resurfaced without interrupting production or traffic. A plastic material, this surfacing can be worked on as soon as floor is laid; it sets by compression. Paramount Industrial Products Co.

108 Grease Resistant Floors with Glamour—Form VI, printed in full color, shows some of the beautiful colors and designs available in company's Vitachrome flooring, a resin-asbestos tile material described as highly resistant to grease and flexible enough to conform to uneven surfaces. Specifications, installation data included. The Tile-Tex Div., The Flintkote Co.

109 Quick-Setting Floor Resurfacer—A plastic resurfacing material which is easily applied and ready for traffic in 60 sec is described in Form 62-8. Discusses flooring's ability to withstand heavy loads and rough treatment. The Monroe Co., Inc.

110 To Keep Floors in Condition—Electric and gasoline-powered floor scrubbers, waxers, polishers, vacuum cleaners, and accessories are described and illustrated in this bulletin. Also describes briefly company's soaps and scouring powders, liquid and powdered cleaners, waxes and sealers. Finnell System, Inc.

111 Paints to Beat Corrosion—This new 8-pp illustrated bulletin is devoted to company's line of anti-corrosive paints. Discusses their sub-oxide of lead base and other technical properties and points out savings in time and money afforded by the use of these rust-inhibitive coatings. Describes primers, finishing coats and single coats available; tells how to apply them. Also discusses painting of galvanized structures. Subox, Inc.

112 How to Reduce Brush Costs—This 24-pp booklet is a recent edition of a deservedly popular handbook on the use and care of paint brushes. Illustrated throughout, it tells how to get the best use and longest wear out of paint brushes and includes step-by-step directions for proper cleaning. Includes a chapter on nylon brushes. Hanlon and Goodman Co.

MATERIALS HANDLING

113 Electric Hoist Manual—Catalog 215-B offers 36 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head room, small hoists, covering capacities to 20 t. Controls, crane assemblies, hoist accessories are also described and illustrated. Specifications, dimensions included. Manning, Maxwell & Moore, Inc.

114 Cranes for Heavy-Duty Work—Fourteen-pp Form 417 on ½ yd crane-excavators with lifting capacities from 8 to 12½ t. Stresses economy and flexibility of the three models—crawler, truck and wagon, —showing how each is convertible to front end attachments. Gasoline or diesel power is optional. Such features as self-leveling chassis, oversize clutches, right angle drive mechanism are described, illustrated. Specifications and operating data are included. Wayne Crane Div., American Steel Dredge Co., Inc.

115 Featherweight Hoist—Form 101, 2 pp, describes a low priced 1½ t capacity winch hoist weighing only 81½ lb. Sketches show the hoist in use on machinery lifting jobs, plumbing work, and heavy duty lifting where use of double cable affords increased capacity. The Lug-All Co.

116 Hoisting Equipment Reference Book—Product illustrations, complete engineering specifications and list prices currently effective on company's entire line of hoisting equipment are presented in 92-pp Catalog 51. Covers chain hoists, trolleys, cranes, sheaves, hoist chain, electric hoists, winches and cranes. Full data on repair parts for each type of equipment is given. Loose leaf binding permits addition of other pertinent data. David Bound & Son.

117 Tiering Made Easy—Company's Improved Model 230 Jeep, a 2000-lb capacity tilting-tiering truck with 130-in. fork elevation is described in Bulletin 295. Photos illustrate increased visibility, short turning radius, other features. Specifications, dimensions given. Mercury Mfg. Co.

118 Package Handling Conveyors—Bulletin PC-450, 12 pp, presents portable and permanent conveyors for handling boxes, bags, cartons, crates etc., picturing many installations. Illustrates seven models, giving dimensions, specifications, mounting data, suggestions for use. Available extras for these conveyors are also described. Conveyor Div., A. B. Farquhar Co.

ELECTRICAL AND LIGHTING

119 Buyers' Manual on Motors and Control—Fifty-pp Catalog GEC-1009 presents buying information on a carefully selected group of motors, motor starters, control accessories and electronic control. Ratings listed are those most frequently required. Excellent data on proper selection of this equipment is provided as well as full descriptions, dimensions, ratings and prices. Fully illustrated. Apparatus Dept., General Electric Co.

120 Synchronous Generators — Bulletin GEA-5470 covers high-speed synchronous generators for standby, portable, and prime-source power in ratings from 1.875 to 50 kva with frequencies of 60 and 400 cycles. Four designs are described: externally-regulated, self-regulated, and packaged-regulated 4-pole synchronous generators, and high-frequency 14-pole synchronous generators. Well illustrated with product pictures and cutaway and ex-

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ploded-view photos, bulletin lists construction features and includes a comparison table of ratings. Apparatus Dept., General Electric Co.

121 Manual Motor Starter—This folder presents a new fractional horsepower motor starter, describing its seven important design features. Operation is explained and both surface enclosure and open-type units are diagrammed. Also included is selection data on choice of correct heater size. Federal Electric Products Co.

122 Package Regulating Equipment—Eight-pp Bulletin GEA-5571 describes manufacturer's Power Packs for a-c lighting and power service, convenient package units which include a primary air circuit breaker, a lighting transformer and air-cooled induction regulators. Explains reason for package regulating equipment and its application. Includes specifications and drawings of single-phase and three-phase package regulating units. Apparatus Dept., General Electric Co.

123 Motors and Generators—Twelve-pp Booklet B-4585, describing company's new d-c motors and generators of Life-Line Type SK series, shows how new design uses rolled steel frames, heavy steel brackets, steel angle feet and pre-lubricated double-sealed ball bearings. Discusses use of cast brass brush-holders, stainless steel springs and Micalsamine Moidarta molded rocker rings to provide corrosion resistance in brush-holder assembly. Describes unit construction of field coils, use of Tufvar insulated conductors in armature. Also shows construction of end turns which causes a fan effect to provide a constant flow of air through the motor. Describes enclosures, mountings. Westinghouse Electric Corp.

124 Standardized Bushings — A new standardization program which replaces more than 1000 types of transformer and circuit breaker bushings with only 36 standard bushings of maximum usefulness is announced in 12-pp Bulletin GEC-715. Standardization on fewer bushings has resulted in savings in production, routine engineering, and manufacturing, and because of this, prices for the standard bushings are 10 per cent less than for similarly-rated non-standard types. Standard bushings listed include transformer and circuit breaker types rated from 15-kv to 230 kv, 1200 amp and below. Apparatus Dept., General Electric Co.

125 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable types. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. A technical section gives standard reel sizes and capacities, standard wire and cable specifications. Generously illustrated with photos showing construction of various types available. Rome Cable Corp.

126 Insulating Materials—Form CDL-13 offers 13 pp of product and application data on electrical insulation materials and industrial laminates. Covers insulating varnishes, sealing and filling compounds, varnished cloth and tapes, silicone and mica insulations, laminated plastics. Tables show properties, recommended uses. General Electric Co.

127 Retractile Cords—Bulletin KKG describes and pictures some of the applications for permanently coiled, neoprene jacketed electric cords which expand to about 5 times their retracted length. Tells features of the cords, how they can be bought and used. An insert gives details on their use as telephone cords. Kolled Kords, Inc.

128 Safety Switch—This 24-pp booklet explains why company's front-operated switch offers cool operation, increased safety, and easy and economical maintenance, illustrating these and other advantages by sketches and photos. Comparison charts show how these switches compare with competitive lines on design and operating features. Federal Electric Products Co.

129 More Light for Your Dollar—Eight-pp Bulletin lb-0333 presents a seven-step light maintenance program to reduce lighting costs and give your plant more light. Covers light meter check-ups, a simplified lamp replacement plan, periodic cleaning schedule, the effect of general decorating on light, reserve stock of parts, proper voltage and labor-saving maintenance devices A practical booklet, it's illustrated throughout and worthwhile reading in the interest of plant economy. General Electric Co.

VALVES

130 Forged Steel Valves—Form 800-A illustrates and describes 800-lb forged steel valves for high line pressure and temperature applications. Covers both inside screw and OS&Y union bonnet gate types, giving dimensions, prices. Special features are described and chart shows trim metals to be specified for different valve parts for different services. The Ohio Injector Co.

131 Valve Buyers' Guide—Catalog 50V, 112 pp, describing company's entire line of bronze and iron body valves, is concise and compiled for easy reference. Listings are complete for valves shown on each page of this handy catalog, and include photos, dimensional diagrams, price, weight, sizes and dimensions, eliminating reference to other pages for these details. A section describing accessories and much essential engineering data is included. Catalog is fabrikoid bound, indexed. Stockham Valves and Fittings.

132 Double-Closure Bin Valves—Circular 334-A on self-opening bin valves for handling lump and fine materials, describes and illustrates their double closure designed to make them dust tight and dribble proof. Includes prices, dimensions. Stephens-Adamson Mfg. Co.

133 Steam Capacity Chart—Letter size and punched for filing in binder, this helpful chart is for determining steam capacity required from safety valves to give 100 per cent protection in case of pressure reducing valve failure. Marine & Industrial Products Co.

MECHANICAL POWER TRANSMISSION

134 New Speed Reducers—The single reduction units described and illustrated in Bulletin A602 are recent additions to company's Torque Arm reducers previously available only as double reduction units. Important advantages and special features of the reducers are listed to show how they provide a more flexible, more economical means of speed reduction. Reducers come in four output speeds from 118 to 330 rpm, in capacities to 27 hp. Selection tables, dimensions, recommended V-belt drives included. Dodge Mfg. Corp.

135 Variable Speed Control—Twelve-pp Bulletin G-508, 12 pp, describes basic operating principle of company's variable speed drives and contains representative rating tables and dimension drawings. Covers capacities from ¼ to 87 hp with stepless speed changes within ratios from 2 to 1 to 16 to 1. Presents three basic units, a variable speed transmission, Vari-Speed Motodrive and motor pulley and a variety of manual and automatic controls for use with them. Reeves Pulley Co.

136 On Bearing Maintenance—Valuable information in this subject is presented in Vol. 1, No. 1 of The AFBDA Bearing Maintenance Report. An article telling how to recognize and correct bearing failures is accompanied by a table picturing the signs of bearing failure and a brief explanation of the cause and correction. Another article discusses bearing removal and installation. This and future issues of this house organ, and a file folder type of binder for them, are available to qualified plant engineers. The Anti-Friction Bearing Distributors Assn.

LUBRICANTS, LUBRICATION

137 Oil for Precision Mechanisms—The special properties of company's instrument and bearing oils for the lubrication of small precision mechanisms and instruments, and how they help solve problems frequently encountered in this type of lubrication are discussed in Form A.D.-5493, an illustrated folder. Gulf Oil Corp., Gulf Refining Co.

138 Lubrication System — Twelve-pp Form 22-125 describes company's oil-mist automatic lubrication system for the continuous lubrication of industrial machinery, designed to cool and ventilate while it lubricates. Illustrated with photos and sketches, tells what the system is, how it works and what it does. Also describes main advantages, tells how to plan an application, to select and install the system. Pictures some typical applications and includes schematic diagram of parts of system. Alemite Div., Stewart-Warner Corp.

139 Lubricant Data Book—Handy and helpful, this pocket-size 56-pp booklet covers use of company's industrial lubricants. Gives product information and principle uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Devotes a chapter to lubricant requirements of equipment in 35 major industries—from bottling plants to sawmills. Also discusses use of a heavy-duty motor oil. Lubriplate Div., Fiske Brothers Refining Co.

140 More Work per Drop of Oil—Illustrated Form 425 introduces company's Micro-Fog, an improved lubricator de-

(Continued on page 121)

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This turbine has two traffic cops...

that give you double protection against overspeeding. The normal speed governor and overspeed governor are entirely separate. A sticky governor valve can't possibly jeopardize the operation of the overspeed governor and trip.

You can elect the governor that meets your requirements!

We have eight candidates for the job, so take your choice:

Mechanical Shaft governor with smooth-acting, long-wearing "rocking chair" action.

Vertical Mechanical governor geared to shaft for speeds above 4500 rpm.

Hydraulic Governor. Direct acting orifice-type for high speeds and/or wide range of speed adjustment.

Hydraulic Oil Relay for close regulation or for supplying extra power for valve movement.

Flyweight Oil Relay for close regulation such as encountered in synchronous generator drives.

Pressure Controls for constant pressure or differential pressure regulation of pumps, blowers, etc.

Speed Changers, manual or remote control by electric motor drive.

Auxiliary Trips to shut off steam in the event of low pressure in the lubrication system or undue rise of back pressure. Also can be solenoid operated for remote or manual trip, or for inter-connection with the driven machine or any emergency system.

Send for Catalog 82-19R

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TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
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PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Keep Recirculating Fan Going

CONTROLS ON a vertical tower, oil-fired, core oven were so arranged that the recirculating fan stopped as soon as the oven shut down. This permitted temperatures in the exhaust duct to build up almost to that of the oven. As a result, core oil deposits in the ducts ignited and fire damage shut down production for the day.

The recirculating fan should be operated for some time after an oven is shut down, and the oven ductwork should be cleaned at frequent intervals. *From Factory Mutual Record, a publication of Factory Mutual Engineering Div., Boston 10, Mass.*

How to Prevent Moisture Seepage In Below-Grade Freezer

MOISTURE SEEPAGE through walls of below-grade rooms that are to be converted to cold storage can have costly consequences unless the condition is corrected before insulation is applied. Sealing the walls from the outside is a recommended cure in most cases. Occasionally, however, walls are located so that digging out around them and applying exterior moisture-proofing is impossible. Then it becomes necessary to devise an alternate means of keeping moisture out of refrigerated areas.

A case in point is a cold storage room recently completed for Klein's Sea Foods, Akron, Ohio. Two freezers and a cooler were to be constructed in an existing building, three walls of which extend about 9 ft below grade. Seepage which occurs through these walls during wet weather could not be stopped externally because the walls were right on the property line.

To meet these conditions, a heavy coat of back plaster was first applied to the inner surface of the walls, followed by a heavy coat of asphalt paint. This vapor-proofing keeps most moisture from coming through.

To neturalize the effects of the moisture that does get through, an air space was provided between the insulation and the sealed walls by

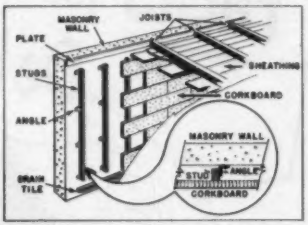

Diagram shows how below-grade walls are insulated against moisture seepage

installing 2 by 4 in. vertical studs against the walls on 12 in. centers. These studs are anchored by angle clips bolted so that the studs set out about 1 in. from the walls. All studs were cut off 6 in. above the floor line and 4 in. below the ceiling line and the ceiling sheathing was stopped 4 in. back from the walls to assure complete air circulation in the space beween the wall and the insulation. Drainage of accumulated water is provided by a 4 in. trough at the intersection of floor and walls.

The first layer of corkboard insulation was dipped in hot asphalt and then nailed to the studs. The vapor seal provided by the asphalt and the moisture resistance of corkboard further protect storage areas from moisture infiltration. Interior finish for the walls is portland cement. *From an article by John Taylor in Armstrong's Insulator, a publication of Armstrong Cork Co., Lancaster, Penna.*

Versatile Jeep Takes the Drill to the Job in a Hurry

Photo: Pennsylvania Drilling Co.

The Penndrill Jeep is Pennsylvania Drilling Co's answer to the need for a light, mobile diamond-core drill for the fast drilling of shallow holes. The drilling unit, which uses standard tools, is mounted on the jeep and driven by its engine through a power take-off; when not in use it can be removed in a few minutes, releasing the jeep for other work. On the way to the job the aluminum mast and other tools ride in the trailer. (From Rope-Ol'ogy, a publication of Macwhyte Co.)

Degrease Tubes — 1-2-3

THERE ARE two vapor degreasing cycles generally used for cleaning tubes to remove drawing and cutting compounds. The warm liquid-vapor cycle is the most common, but the boiling liquid-warm liquid-vapor cycle is employed where contaminants are unusually stubborn.

The tubing can be handled in bundles by two chain hoists, each holding the bundle a few feet from the end by means of a wire rope sling. Another method, especially applicable for short-length work loads, employs a single hoist with a fixture for holding the tubing in proper position.

The bundle of tubing entering the degreaser should be inclined at an angle of approximately 15 deg from horizontal. This practice reduces the possibility of trapping air or vapor which prevents thorough cleansing of the tube interiors. The bundle should be removed at the same angle

Flexible lighting system that can be easily changed without rewiring

Move or add lights *anytime, anywhere* with BullDog Universal Trol-E-Duct

Meet changing conditions quickly, economically with this truly flexible lighting system.

To move or add lights, simply pick the right spot and insert handy twist-out plug or trolley. Every inch of this money-saving 50-ampere duct system is a tap-off! Prefabricated and standardized in lengths from one to ten feet, it can be dismantled and moved to a new location without scrapping a single part.

Call in your nearby BullDog Field Engineer for more information about this modern lighting system. He will be glad to show you an installation near your own plant. Or write BullDog direct for descriptive literature.

BULLDOG ELECTRIC PRODUCTS COMPANY

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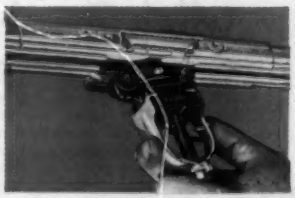
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

To tap off current at any point along slot, insert twist-out plug and give it 90° turn. Plugs are grounded on steel casing before contacts touch bus bars; narrow access slot protects operator.



Trolley type outlets are used where mobility is essential—for drop-cord lighting in stock bins and inspection areas or small portable tools.

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Barcol OVERdoors

will do the job - and do it well!

An outstanding feature of Barcol OVERdoor design is the fact that these improved overhead-type doors perform particularly well in large industrial installations such as illustrated above. They show long life and low maintenance — both important factors in efficient plant operation. Barcol Electric Door Operators, designed and built to handle the doors properly, are available in all sizes with a wide variety of controls. Consult your Barber-Colman representative for full details — you can find him in the "yellow pages" of the telephone directory.

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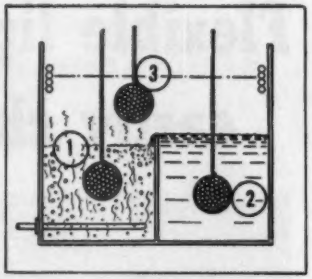


This three step method is recommended to clean tubes of stubborn contaminants

to facilitate drainage of the solvent. The rate of movement of the load in the degreaser should not exceed 11 feet per minute.

In the boiling liquid-warm liquid-vapor degreaser, intensive mechanical action is obtained by plunging the bundle of tubes into the boiling solvent and then removing the work slowly from the liquid. This allows the entrained solvent to drain back into the boiling chamber before the bundle is transferred to the warm liquid rinse compartment. *From an article by R. S. Armstrong in Modern Metal Finishing, a publication of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.*

Storage Tank That Swims

A LARGE storage tank had to be moved to permit repairs to its foundation. This was accomplished by flooding the area within the fire walls and floating the huge vessel to one side. To prevent distortion and buckling, it was necessary to erect internal shoring on the tank bottom.

Tractors moved the tank through the water by steel cables, fastened to shackles that had been attached to the tank shell. After moving the tank, the area was drained and foundation work completed. Later, area was flooded again and the tank moved back to its original position. *From The Atlantic Magazine, a publication of The Atlantic Refining Co., Philadelphia 1, Penna.*

Photo: The Atlantic Refining Co.

Large storage tank is floated to one side to permit repairs to its foundation. Internal shoring of tank bottom was necessary to prevent any tank distortion

DEMPSTER DUMPSTER SYSTEM

SERVING COST-MINDED MANAGEMENT FROM COAST TO COAST

. . . handling bulk materials of every description at phenomenal savings

Photos show the three simple stages of servicing a container. One man, the driver, and truck-mounted Dempster-Dumpster are constantly busy, picking up, hauling, and dumping one pre-loaded container after another. Dempster-Dumpster Containers range in capacity up to 12 cu. yds.

ESSO – recognized across the nation

Esso Standard Oil Company, well known for sound management, uses the Dempster-Dumpster System

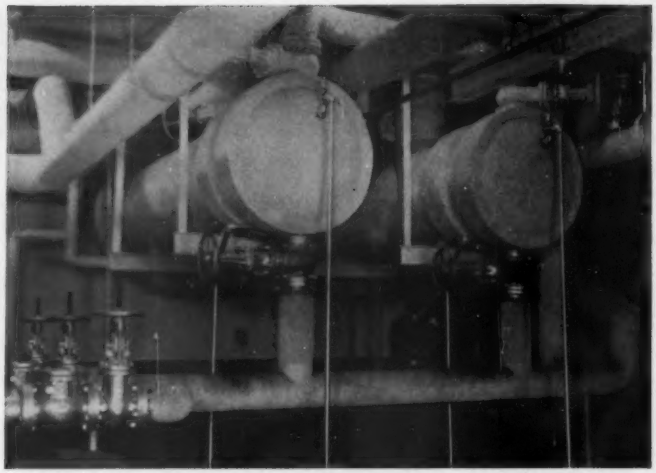
Esso Standard Oil Company is among the hundreds of cost minded manufacturers, both large and small, using the Dempster-Dumpster System of bulk materials handling . . . the system recognized across the nation for its efficiency and ability to reduce costs.

The Dempster-Dumpster System of materials handling consists, basically, of one truck-mounted Dempster-Dumpster and any number of detachable Dempster-Dumpster Containers, which are spotted at convenient materials accumulation points inside and outside buildings. Containers are available in a wide variety of designs best suited to the type materials handled—be they bulky, light or heavy . . . solids, liquids, or dust . . . trash or rubbish.

The Dempster-Dumpster System reduces equipment together with investment and operation costs . . . eliminates standing idle time . . . eliminates re-handling of materials . . . and increases efficiency, sanitation and good "housekeeping." It will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers. . . All Designs. . . All Sizes

DEMPSTER BROTHERS • 131 Shea Building • Knoxville 17, Tennessee



ADSCO HEAT EXCHANGERS

are "job-selected" for top efficiency!

● It's the job to be done that determines the selection of the proper heat exchanger. Few heat transfer problems are exactly alike and many require special engineering to achieve optimum results. Production is too important these days to permit inefficient operation and needless shut-downs. Insist on equipment built for the job and built to last.

ADSCO has always recognized the need for "tailoring" the equipment to the job. Its engineering department is constantly analyzing heat transfer problems and "job-selecting" the proper heat exchanger for the application. Every recommendation is backed by seventy years of experience in designing, manufacturing and installing steam equipment. Because ADSCO makes all types of heaters in a wide range of sizes, it can deliver the heat exchanger best suited for specific operating conditions.

Consult your ADSCO representative or submit your heating or cooling problem direct for a factory recommendation and quotation.

INSTANTANEOUS WATER HEATERS are furnished as either steam tube or water tube types. Commonly used as instantaneous heaters, booster heaters, convertors, pool heaters or economizers.

STORAGE HEATERS of welded construction in vertical and horizontal types. Removable U-tube element. Wide choice of materials. A. S. M. E. Code stamped when required.

FLOAT HEAD HEAT EXCHANGERS (Also shown in installation picture above) can be furnished with removable tube bundle and with split clamp ring construction for float head. Complete range of sizes to meet all specifications.

AMERICAN DISTRICT STEAM COMPANY, INC. ★ North Tonawanda, N.Y.

Saplings to Sawdust

ANYONE WHO has ever tried to cut out the underbrush on his garden plot or wrestled with an overgrown hedge can understand the problems that construction men face on a much larger scale. Power line builders and maintenance men must remove and control underbrush under mile after mile of their high tension lines. And the same thing is true of railroad and canal right-of-ways.

Now there's a vehicle on the market that bids to do the land clearing jobs in much less time and for much less money. It's called the Bushwhacker and it's powered by engines from General Motors' Detroit Diesel Engine Division.

The Bushwacker's secret is in its steel flails—20 lb edged pieces that literally "chew up" all the vegetation in their path. The diesel powers the drum which holds these flails

The Bushwhacker won't stop with just mowing down these trees. Its steel flails will chew them up along with all other vegetation that gets in its path

and which revolves at 1050 rpm. The drum is mounted on a conventional tractor.

During one test the Bushwhacker is reported to have cleared an acre of vegetation (including trees 8 in. in dia) in an hour — at a cost of $40.00. By hand the same job would have taken 200 manhours. *From G. M. Folks, a publication of General Motors Corp., Detroit 28, Mich.*

Milium—Warmth from Metal

PEOPLE SEEKING lighter clothes, yet offering them the same amount of warmth, will find the answer in the new miracle cloth lining called Milium.

The principle of spraying the lining of garments with an aluminum solution was developed by James H. Rand III. The reason for doing this is that in a garment made of fabrics which have practically no radiation retention qualities, radiated body heat travels from the body, through the fabric, and out into space where it is lost. In a garment where one side of the lining has been coated with aluminum particles, heat travels from the body to the fabric and is reflected back to the body again. This helps the wearer to keep comfortably warm; yet it adds less than

NOW more important than ever to you

You are, or may soon be, shifting your production setup to meet the country's rearmament needs. New machines, new operations, and faster production schedules will demand some revision of your lubrication practices. That's why Standard's Service-Supply organization is now more important than ever to you.

Standard has a service-supply warehouse within a short truck-hauling distance from your plant.

If you are a Standard Oil customer this warehouse will stock every lubricant used in your plant. Deliveries can be made in a few hours if necessary.

In addition, this service-supply center is headquarters for a Standard Oil lubrication specialist who is assigned to your plant. He is close at hand to give you help when you need it. He has plenty of practical experience. He has been specially trained for his job in a Standard Oil Lubrication Engineering School. He is backed by Standard Oil's extensive research and technical facilities.

To arrange for his visit, phone your nearby Standard Oil Service-Supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD

Kid Gloves Not Needed!

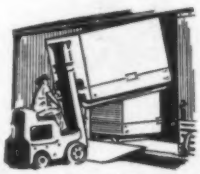
Here's one panel material that needs no "special handling." Reasonable care? Yes. Kid-glove treatment? NO. Douglas fir plywood is *real wood*, cross-laminated for strength. It's tough, durable, split-proof, puncture-proof. Won't crack, chip, break or shatter. Requires only ordinary woodworking tools and techniques. Does a thousand jobs . . . in building and maintenance, in product design and manufacture, in the packaging, shipping and container fields. The coupon brings more information; mail it today.

Put These Advantages To Work For You!

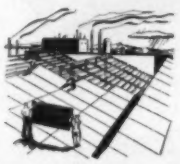
Douglas fir plywood is real wood, cross-bonded into panels that are:

Large, Light, Rigid
Stronger than Steel (pound for pound)
Rugged, Durable
Split-Proof
Puncture-Proof
Crack-Proof
Shatter-Proof
Dimensionally Stable
Versatile*
Easy to Handle
Easy to Saw
Easy to "Jig"
Easy to Nail
Easy to Fasten
Easy to Glue
Easy to Bend
Easy to Finish

*Two types: waterproof-bond EXTERIOR; moisture-resistant INTERIOR. Several appearance grades. Panels 4'x8' most versatile; smaller and larger sizes, too—including "extra long". Several thicknesses. Produced to rigid requirements of U. S. Commercial Standard CS45-48.



Plywood Shipping Cases Are Light, Rigid, Strong



Strong, Rigid Plywood Sheathing Saves More Than 25% on Application

Plywood Speeds Bin Construction, Gives Long Service, Low Upkeep

Plywood Pallets are Light-Weight, Rigid, Strong—and Durable

Douglas Fir
Plywood

AMERICA'S BUSIEST BUILDING AND INDUSTRIAL MATERIAL

Douglas Fir Plywood Association
Dept. 473, Tacoma 2, Wash.
Please send me the following:

☐ 1000 Uses for Douglas Fir Plywood
☐ Basic Plywood Catalog

Name.....
Title.....
Firm.....
Address.....
City.....Zone....State.....

one ounce to the weight of the garment.

Deering, Milliken and Co., manufacturers of Milium, are offering these fabrics for the first time this year in the linings of men's, women's and children's coats and outerwear. Several manufacturers have considered the use of these fabrics for draperies and possible applications in automobile tops and awnings. *From Kaiser Aluminum News, a publication of Kaiser Aluminum and Chemical Corp., Oakland, Calif.*

Maintenance Extends to Bees

Here is a good example of the variety of duties a maintenance man has to tackle. This swarm of bees picked the plant wall as a resting place. It took 45 minutes to get the bees in the box. (From The Westinghouse News, a publication of Westinghouse Electric Corp.)

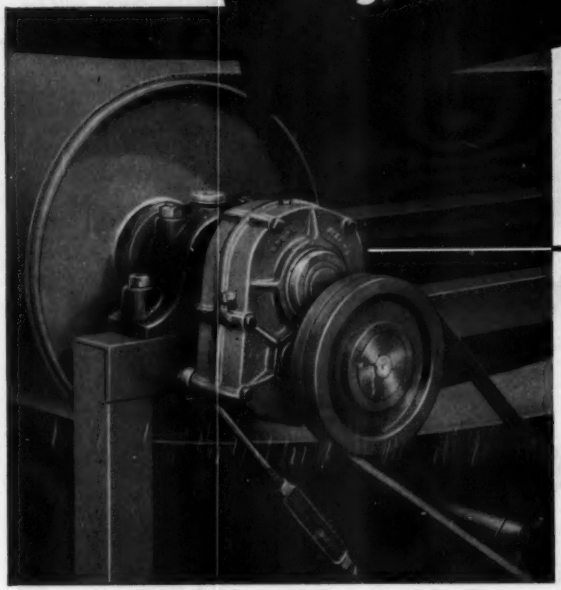
Automobile Engines of Tomorrow

HIGHER COMPRESSION engines and the requisite higher octane gasolines have been primarily responsible for the improvement of today's automobile engine which delivers 30 per cent more power and gives 40 per cent better mileage.

Interest in even more radical departures has led to at least two new types of engines not requiring high-octane gasoline which have advanced to the test stage recently. One of them is the new Texaco Combustion Process which avoids knocking by feeding the gasoline into the cylinder as it burns, to prevent its exploding all at once, thus making special anti-knock fuels unnecessary.

This engine is similar to the conventional engine, but the carburetor is replaced by a Diesel-type fuel injector. The fuel is injected directly into the cylinder, in which the air is made to swirl rapidly by a shrouded intake valve. The fuel burns as it enters the cylinder; consequently, the cylinder is never filled with a potentially explosive

THE SPEED REDUCER THAT SAVES YOU MONEY!



Dodge

Torque-Arm

America's Most Complete Line of Shaft-Mounted Speed Reducers

- No special engineering required. No foundation to provide. No flexible couplings. No sliding base. No "lining-up" difficulties. No expensive installation. Stock TAPER-LOCK sheaves prescribed for each job to provide desired speeds. Application to other machines is practical and easy.
- Unit is driven through any V-Belt Drive. Torque-arm, fastened to any fixed object, anchors the reducer unit. Turnbuckle provides fast and accurate adjustment of belt tension.
- Backstop available from stock when required. Simple. Positive. Easily installed. Sealed inside the reducer housing.
- Compact, light weight, *rugged*. Quality built by Dodge for Dodge *dependable* service.
- Built in two series—Single and Double Reduction. Capacities from 1 to 27 h. p. Speeds from 12 to 330 rpm. Available from distributors' stocks.
- WRITE for special bulletin A602.

DODGE MANUFACTURING CORPORATION, 2700 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES

DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND B CLUTCHES

SOLID STEEL CONVEYOR PULLEYS

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO, ILLINOIS

Get power faster...

WITH

Ramset

FASTENING SYSTEM

Fastening bus ducts, wiring and other electrical services into steel or concrete, can be done far faster with the high-speed RAMSET FASTENING SYSTEM. Requiring less than a minute per fastener, from start to finish, RAMSET does the work in minutes instead of hours, at far less cost than conventional methods. This same speed can be applied to the 1000-and-1 jobs calling for anchoring into structural materials.

The light, powerful, self-contained RAMSET TOOL is easy to operate. Exclusive *tap* or *turn* DUAL-ACTION gives a choice of operating methods. Improved ROTO-SET SAFETY SHIELD locates the fastener exactly where you want it, with pin-point accuracy. A wide range of sizes and types of fasteners, from 1" to 6" long, and graded power charges, fit RAMSET SYSTEM to practically any kind of work.

See DUAL-ACTION in ACTION!

Ask your local RAMSET Specialist for a demonstration and full details, or write us. Be sure to use only genuine RAMSET products for fast, economical fastening. *Ramset Fasteners, Inc., 12117 Berea Road, Cleveland 11, Ohio.*

FASTEN FASTER WITH Ramset System

FASTENING SYSTEM

Pioneer in powder-actuated fastening

mixture of fuel and air. The driver controls speed by varying the rate of injection of fuel alone. With the air change in the cylinder relatively constant, the engine has available a lean mixture for light loads and a rich mixture to take care of any heavy loads.

The other consideration is the use in automobiles of gas turbine engines similar to the aircraft turbine-prop, in which the products of combustion drive a turbine or windmill, rather than a piston in a cylinder. The advantages of these engines include small size and weight, simplification of ignition and lubrication problems, and, of greater importance, the fact that the gas turbine develops maximum torque, or pulling ability, at low speeds, achieving a virtual built-in automatic transmission, with elimination of gear-shifting and clutch. On the other hand, fuel consumption is high, although the fuel may be somewhat cheaper, and special provision must be made to prevent overheating and to connect the high-speed turbine to the low-speed wheels. *From Industrial Bulletin, a publication of Arthur D. Little, Inc., Cambridge, Mass.*

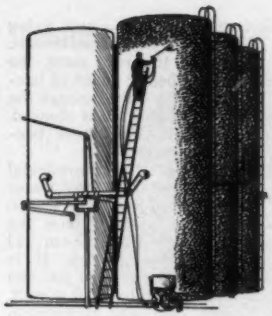
Germicidal Lamp Purifies Water

WATER IN the Yuma Mesa irrigation ditches starts out high in the Rockies as pure rain or snow. Along the approximately 1,400 mile descent from the Rockies to the Yuma Mesa, the water loses some of its purity, at least to the point where it is not considered safe for drinking.

Mr. and Mrs. Didier display part of water system installed on their homestead. Water softener is at right, germicidal lamp in center and automatic heater is at left side of lamp

Some of the homesteaders are solving this problem with the technical advice of reclamation engineer Joseph P. Callopy. They run the water through sand filters, then treat it with germicidal lamps. The filters remove any traces of silt, and purify the water to a large extent.

The method of purifying water by ultraviolet rays was chosen after many tests were conducted with several commercial devices of various design, using different chemicals.

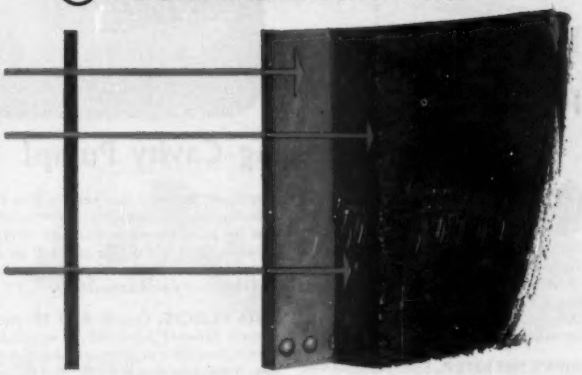


one coat of **Insul-Mastic** type "D"

prevents

- **corrosion**
- **heat loss**
- **condensation**

- **Surface to be coated and insulated.**
- **Insul-Mastic Coating, with its high Gilsonite content, prevents corrosion by stopping moisture, acids, alkalis and salts from contacting the surface under the coating.**
- **Granulated cork, in large amounts, insulates the vessel. Up to 65% of heat loss can be prevented or condensation can be controlled with a ¼" application.**



Insul-Mastic Type D insulation requires no vaporseal or further protection. It will not absorb moisture and thus will retain full insulating efficiency throughout its life. As an insulation, it has a K factor of .36 which is approximate to that of cork board. Insul-Mastic Type D is spray applied and will adhere at any angle without mechanical support. Type D can be used on surfaces having a temperature range from minus 40° F., to plus 300° F., without deterioration.

Insul-Mastic Type D has been used to prevent heat loss on oil storage tanks, paper pulp digesters, liquid sugar tanks, warm air ducts, prefabricated metal buildings and many other types of equipment, piping, etc. It controls condensation on cold water intake pipes for boilers, in railroad freight cars, on building panels, corrugated metal roofs, and cold air ducts, etc.

Write for our booklet, "INSUL-MASTIC TYPE D INSULATION" and for the name of your nearest Insul-Mastic representative.

Think first of the coatings that last!

Insul-Mastic Corporation
OF AMERICA
1163 OLIVER BUILDING · PITTSBURGH 22, PA.
Representatives in Principal Cities

ROYAL Haeger POTTERY

EVERY OUNCE OF
passes through a
MOYNO Progressing-Cavity Pump!

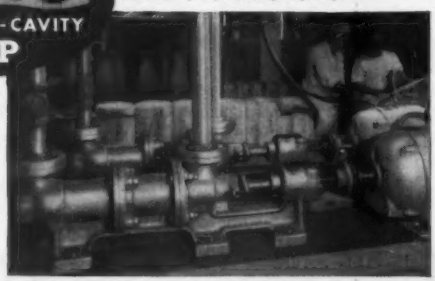
Trimmers' knives last only *four months*, but the R & M Moyno Progressing-Cavity Pumps are still going strong after more than *four years*—without a penny spent on repairs. Haeger Potteries, Inc., has five of these pumps—three at Dundee, Ill., two at Macomb, Ill.—for moving the *entire* production.

HERE'S THE SETUP. Each pump serves a complete molding floor where mixed clay is forced through a circuit with several outlets. At Dundee—*world's largest art pottery*—this service line is 3-inch pipe, 250 feet long. 2000 molds can be filled on each floor in thirty minutes, and many are refilled once or twice a day. Pumps usually operate intermittently and frequently.

CUTS REJECTS. One R & M Moyno feature Haeger particularly appreciates is the uniform pressure and *steady flow* these amazing pumps deliver. It means faster, cleaner mold-filling—without pinholes. If *you* have a tough pumping problem, call in your Moyno Man today, or write for informative free Bulletin P-32-E.

R & M MOYNO® PROGRESSING-CAVITY PUMP

Moynos self-prime, resist abrasives and chemicals, pass particles and solids in suspension, won't vapor-lock or cavitate, reverse—pump virtually anything.



Arnold B. Vogel, head of molding and finishing at Dundee, watches a filling operation. "Our Moynos are wonderful . . . no trouble of any kind," says he. Pumps have 5-h.p. motors; deliver 50 gallons per min.

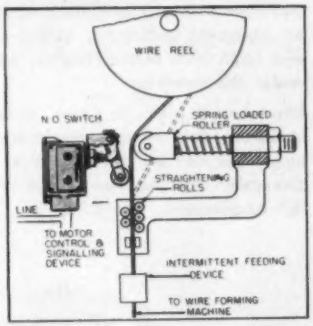
ROBBINS & MYERS • INC.
SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO
MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS

A before and after water test, using the ultraviolet ray treatment, showed that in the raw state, the water carried a heavy count of bacteria. After water passed through the purifier, the biological test showed, without exception, that these bacteria were not present.

The capacity of these germicidal lamp units, or the amount of water they are capable of purifying within a unit of time, depends upon the temperature, turbidity, chemical content, and other factors. It is roughly estimated that 300 gal can be purified per hour by a 15 w unit.

Mr. Callopy cautioned farmers on other projects, who are considering similar installations, to consult with the local public health authorities or other qualified authorities. The system which works on the Yuma Mesa may not work in other areas where factors are very different. *From The Reclamation Era, a publication of The Bureau of Reclamation, U. S. Dept. of Interior, Washington, D. C.*

Switch Controls Operation On Wire Machines



Wire fed to an automatic wire forming machine occasionally becomes tangled on the reel and will not strip off. A snap-action switch, mounted as shown, will shut off motor and signal operator if wire strips too hard or if wire supply is exhausted. (From an article by R. C. Eckler, in Micro Tips, Micro Switch)

Check Electric Cords When Checking Boilers

BEING EXCELLENTLY grounded, a boiler provides a good path for leaking electric current from a defective extension cord. And the internal surfaces of a boiler which are usually wet provide a good electrical contact with the human body. With this combination of circumstances, there is every chance that a workman handling an extension cord while inside a boiler will be subjected to the full circuit voltage if there is a fault in the wiring or lamp socket.

One remedy of this hazard is the use of only the best waterproof extension cord equipment. Even greater safety can be obtained, how-

American Blower . . . a time-honored name in air handling

In Seattle, a leading university, as well as commerce, industry and public utilities, have made use of American Blower's Branch Office by calling Seneca 5860. To contact the American Blower Branch Office in your city, consult your phone book.

PLEASANT IDEA . . .

In Seattle, as in your home town, apartment house owners realize that invigorating, fresh air indoors can do much to attract desirable tenants. American Blower Utility Sets do just this. The Utility Set is ideal for general ventilation where duct systems are required. It can be used as a supply or exhaust fan and is equipped with Aileron Control for regulation of air flow. They're available as standard packaged units ready for immediate installation. Is there an idea here for you?

PROFITABLE IDEA . . .

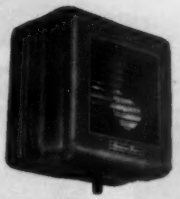
Fuel savings alone often will pay for a new heating system when you replace obsolete equipment with American Blower Unit Heaters. For example, a manufacturer of specialty equipment investigated and found he could convert his whole plant to unit heaters and pay for the system in 3 years with the fuel savings alone. American Blower carries a complete line of Unit Heaters, including gas-fired models and models for steam or hot water heating systems, wall- or ceiling-mounted.

FRESH IDEA . . .

We know an advertising agency in one of our larger cities that recently moved their offices into one of those beautiful old homes along the river. The ventilating system was adequate for a family, but converting it for commercial use posed some problems. But American Blower equipment solved them nicely. For example, smartly-styled Aeropel Fans now keep the conference rooms pleasantly fresh, Utility Blowers ventilate rest rooms, and Ventura Fans handle the large work areas. End result, they say—fresh air fosters fresh ideas.

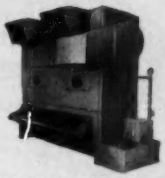
MAY WE SERVE YOU?

American Blower heating, cooling, drying, air conditioning and air handling equipment can do much toward improving comfort and efficiency in your business. For data, phone or write our nearest branch office.

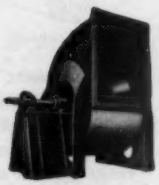


Unit Heaters

Ventura Fans



Air Conditioning Equipment



Industrial Fans

Utility Sets

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
WEST COAST PLANT: SAN LEANDRO, CALIFORNIA

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

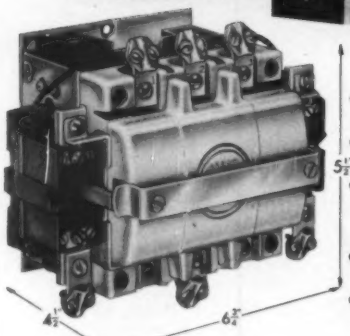
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

ARROW AH HART

Advanced Design

TYPE "RA" MAGNETIC STARTERS

EASY TO WIRE
EASY TO SERVICE



- SMALLEST AVAILABLE
- STRAIGHT-THRU WIRING
- AMPLE WORKING SPACE IN BOX
- HIGH ARC RESISTANCE
- DEPENDABILITY.... LONG LIFE

SIZE 2 ILLUSTRATED

Plant engineers, installation-and-maintenance men, and working electricians praise the Arrow-Hart Type "RA" Magnetic Starters for a handful of reasons: a small-size starter in a good-size box affords plenty of room for hands; terminals and contacts are easily reached and serviced; wiring is straight-thru all the way; all components are easy to get at; and the many extra features packed into the compact "RA" design gives the A-H starter extra dependability, puts it top of the list for performance. It's the logical starter for new equipment and for replacement. Write for FREE descriptive folder G-7005, complete with dimensions, ratings and other important data.

AVAILABLE IN SIZES 0, 1, 2, 3, and 4.

ARROW AH HART

THE ARROW-HART & HEGEMAN ELECTRIC CO.

ARROW·HART

1103 HAWTHORN ST., HARTFORD 6, CONN.

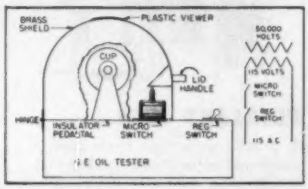
ever, by the use of reduced voltage for the extension light. In one plant, a transformer was installed to provide 32 v lighting for the entire boiler room.

This use of low-voltage lighting (in the range of 40 v or less) provides the best safeguard against electrocution due to faulty extension light equipment. A second consideration is the use of good, waterproof equipment which is kept in top condition. *From The Locomotive, a publication of The Hartford Steam Boiler Inspection and Insurance Co., Hartford 2, Conn.*

Oil Checked with Added Safety

IN OUR PLANT great quantities of a special type of oil require checking by dielectric breakdown methods.

To insure safe operation of the 50,000 v, 1 cup measure, electricians installed a single-pole snap-action switch in series with push button in the primary circuit. The switch is closed as the brass cover with plastic



This single-pole snap-action switch gives added safety to the personnel

window is closed down over the pedestal insulators supporting the cup and its internal spark gap. The operation slows down production 2 per cent over no safety device, but it assures a safer operation. *From an article by Paul C. Ziemke, in Micro Tips, a publication of Micro Switch, Freeport, Illinois.*

Check Relief Valve Chatter

NEARLY EVERY plant engineer has at some time installed a relief valve, only to have it squeal, drum or chatter. The valve in such cases should not be condemned. Possible causes should be analyzed and corrective measures taken.

Valve oversized—Ordinarily, this is simply a problem of careful sizing of valve in proportion to flow. However, a condition of relative oversizing may result from an inadequate or starved entrance condition. The best approach is always to correct the piping or inlet condition.

By-pass application—This condition may be met by using two relief valves, one sized to carry normal by-pass flow; the other, set at a somewhat higher pressure, to cut in when total pump load must be carried.

Outlet piping inadequate—Never reduce outlet piping below outlet size of relief valve. If long outlet

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement • • • • • • •

malleable iron clamps for fire protection, plumbing, and heating up to 450°F

I-Beam Clamp
fig. 131
for 2 to 6-in. flange

Center I-Beam Clamp
fig. 217
safe load: 150 lb

Simplex Top Beam Clamp
fig. 267 — safe load:
150 to 2300 lb

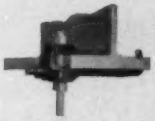
Swinging Top Beam Clamp
fig. 270 — safe load:
150 to 2300 lb

Universal Channel Clamp
fig. 226 — safe load:
150 to 2300 lb

Channel Extension Clamp
fig. 219
safe load: 150 lb

Simplex Channel Clamp
fig. 266 — safe load:
150 to 2300 lb

Universal Side I-Beam Clamp
fig. 225 — safe load:
150 to 2300 lb



Simplex Side I-Beam Clamp
fig. 265 — safe load:
150 to 2300 lb

C-Clamp
fig. 88
⅜ to ¾ -in. rod.

steel I-beam clamps for process and power plant service

UFS W-F I-Beam Clamp With Links and Weldless Eye Nut — fig. 293
safe loads: up to 11,500 lb

UFS I-Beam Clamp with Weldless Eye Nut
fig. 292 — safe loads:
up to 11,500 lb

UFS W-F I-Beam Clamp With Links
fig. 294 — safe loads:
up to 11,500 lb

UFS I-Beam Clamp
fig. 228 — safe loads:
up to 11,500 lb

concrete inserts

C-B Universal Concrete Insert
fig. 282
⅜ to ⅞-in. rod

C-B Junior Concrete Insert
fig. 279
½ to ½-in. rod

Screw Concrete Insert
fig. 151
½ to ⅝-in. rod

Expansion Case Closed Back Type
fig. 117
¼ to 1-in. rod

Write for Hanger Catalog 10D

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago
Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York
Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

SAVE IN INSTALLATION!

The spherically-ground, true ball joint of a Dart easily gives a snug, drop-tight fit. There's no need for fussing — no need for excessive wrenching — no lost time in installation.

SAVE IN MAINTENANCE!

This same design feature makes uncoupling fast and easy, too. And you'll find the seats clean and unmarred—ready for re-installation without any time loss.

What's more, Darts save in other ways. The bronze-to-bronze seats have highest resistance to pitting and corrosion; body and nut of high-test, air-refined malleable iron are practically indestructible. Thus a Dart lasts years longer—eliminates the replacement costs of inferior unions.

DART UNION COMPANY
Providence 5, Rhode Island
The Fairbanks Co. — Distributors
Boston New York Pittsburgh

DART UNIONS

is required, increase size of outlet piping.

Valve set pressure — Set relief valves 20 to 25 per cent above operating pressure to avoid possibility of valve set pressure being too close to operating pressure.

Pop type valve—When a pop (vapor or gas relief) valve is used instead of a hydraulic type relief valve, compensation should be made in the ring adjustments. The control ring should be backed away to inoperative position when a pop valve is used for liquids.

Harmonic overpressure — If the system is subject to harmonic overpressures, sometimes encountered on high pressure systems, an air column in the system will help compensate for this. *From an article by W. F. Braun, in Meters and Controls, a publication of Meters and Controls Inc., Chicago 1, Ill.*

Mechanical Man Teaches Safety

"Elmer," mechanical gadget, demonstrates what happens when a lift is improperly executed. Top photo shows right way, stooping and using legs instead of back. Lower photo shows wrong way in which Elmer's vertebrae are pulled apart as heavy object is lifted with back alone. (From Convariety, a publication of Consolidated Vultee Aircraft Corp., San Diego, Calif.)

The City Ice and Cold Storage Co., of Kansas City, Kansas, saved much space with this very compact Vulco Rope Drive on the huge compressor shown. Mr. H. L. Frentrop, Chief Engineer, says of this Drive: "It has been in operation for 17 years and the *original* Gates belts still look good for many years of service."

This Simple Test Tells WHY the Concave Sides of Gates Vulco Ropes Mean *Longer Belt Life!*

Prove this *yourself*—in two minutes' time.

Take any V-belt that has *straight* sides. *Bend* that V-belt while you grip its sides between your fingers and your thumb. You will *feel* the sides of the belt *bulge out*—as shown in figure 1-A, below.

Clearly, that outbulge forces the sides of the belt to press *unevenly* against the V-pulley—and this concentrates the *wear* where the bulge is greatest.

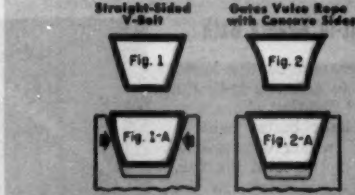
Now, make the same test with the belt that is built with the Concave Sides—the Gates Vulco Rope.

Figures 2 and 2-A show clearly what happens when you bend a Vulco Rope. Instead of *bulging*, the precisely engineered Concave Sides merely *fill out* and become perfectly straight. There is no side-bulge. This belt, when bent, precisely fits its sheave groove.

Because there is *no bulging*, the sides of the Gates Vulco Rope always grip the *full* face of the V-pulley *evenly* and therefore wear *uniformly*—resulting in *longer belt life* and *lower belt costs for you.*

Only V-belts made by Gates are built with concave sides. Whenever you buy V-belts, be sure that you get the V-belt with the Concave Sides—The Gates Vulco Rope!

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill Out to a Precise Fit in the Sheave-Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

CS-511

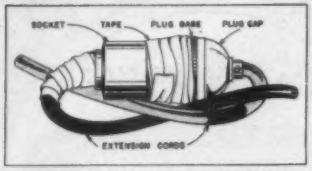
THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts

Gates VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

MAINTENANCE & OPERATION

of buildings, utilities and facilities

For Secure Extension Cords



When using extension cords, the plug base can be prevented from loosening in socket due to vibration by applying several layers of tape over the base and socket. Tying knot in cord will also help to prevent cords from pulling apart

Double Layer Insulation

APPLICATION of molded insulation in two layers instead of a single layer of equivalent thickness results in a more efficient and, where a fire hazard is present, a safer installation, according to The Magnesia Insulation Manufacturers Association.

Expansion and contraction of high temperature equipment often causes joints between insulation blocks or sections to open. Enough heat can escape through these cracks to materially reduce the effectiveness of the installation. Furthermore, the canvas or cement finish around the joint area may become sufficiently scorched to require repair or replacement.

Open joints are particularly dangerous in a fire hazard area, such as a refinery where a leak or break in an adjacent pipeline or vessel would allow escape of a flammable liquid. In a southwestern refinery enough heat escaped from the open joints of the insulation on a pipeline to ignite some oil-soaked materials left temporarily on the line.

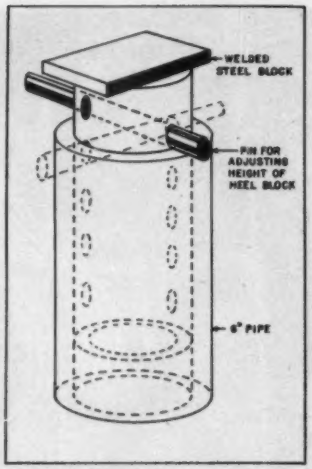
Double layer insulation permits the use of staggered joints and prevents these troubles. After the first layer is wired on, the sections or blocks in the second layer are applied so that each joint is centered over a block or section underneath. If the joints in the inner layer should open, the outer layer acts as an effective heat seal. In this way, there is no path of heat escape from the equipment surface to the outside.

Adjustable Heel Blocks

Contributed by Thomas Thoresen, Allis-Chalmers Manufacturing Co.

ADJUSTABLE heel blocks of pipe have been devised for setting up test rigging and in clamping down large motor and generator jobs. These blocks replace wooden ones which previously were scrapped after being used one time, resulting in from 12 to 100 ft of hardwood lumber being discarded after each job.

The new blocks consist of two pipes which telescope, as shown in sketch. The outer pipe is 6½ in. OD by 1 in. (wall thickness) by 12 in. in height. The inner pipe is 5 in. OD by ⅞ in. (wall thickness) by 12 in. in height. A steel block, 1 by 4 by 5½ in., is welded to the top of the smaller pipe.



Adjustable heel block will come in handy for numerous jobs in the plant

Holes, 1-1/16 in. in diameter, are drilled on four sides of the smaller pipe, 90 deg apart. The holes are drilled at 2 in. intervals and staggered so that the bar can run through them to give increments of 1 in. for adjustments.

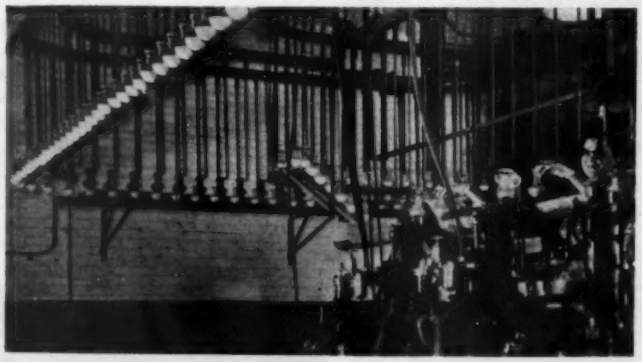
Identify Lubricating Equipment

BY PAINTING a colored band around the barrels of grease guns and the bodies of hand type oilers and a similar band around the bodies of grease fittings and the tops or caps of oil hole covers, the chance of error in applying the correct lubricant can be reduced.

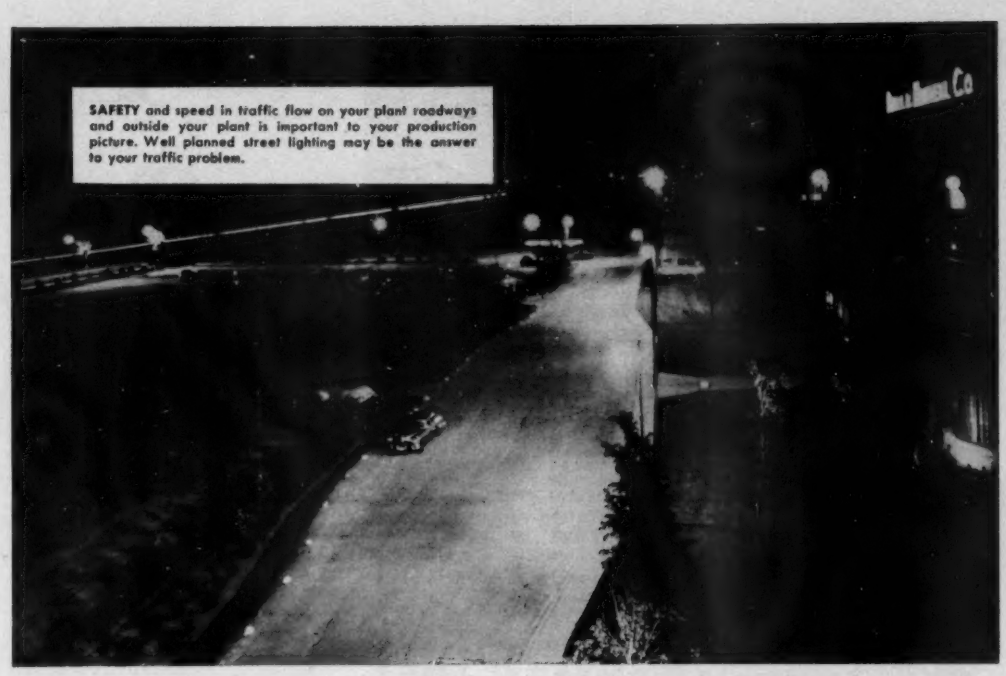
Each lubricant fitting or cover should be given the same color as the gun or oiler containing the

Bulbs Get Built-In Beauty Bath

A BATH OF enamel on the lower portion serves to enhance both the appearance and lighting characteristics of new light bulbs "with a built-in shade," which were introduced recently by General Electric. Here the bulbs are shown in the process of being suspended by the operator on a conveyor which dips them in enamel, transports them to a machine which cuts a decorative design in the enamel, and thence carries them through a furnace, where the enamel is baked on permanently. The finished bulbs, designed for use in multiple-socket ceiling fixtures which burn bare bulbs in a bowl-down position, produce a soft, mellow light.



Operator is hanging the "upside-down mushroom" bulbs on a conveyor which dips them in enamel and carries them to a design-cutting machine and furnace


SAFETY and speed in traffic flow on your plant roadways and outside your plant is important to your production picture. Well planned street lighting may be the answer to your traffic problem.

Can you afford to neglect Lighting on your outdoor production lines?

As production becomes the key word in today's industrial picture, you are again faced with the problem of "keeping 'em rolling" from entrance gate to railroad siding.

Plan now to keep the out-of-doors elements of your plant at peak operation with soundly planned outdoor lighting. New types of fixtures, improved lighting techniques, minor adjustment of your present lighting equipment can give you a completely modern system at moderate cost.

For planning help call in the lighting specialist at your local G-E office. He is trained in today's lighting requirements and techniques. Or write for the free bulletin *Outdoor Lighting for Industrial Plants. (GEA-3640.) Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

SPEED is becoming the vital factor in production and distribution. For a modest investment outdoor lighting can add speed to your operation.

PROTECTION offered by fences and walls can be doubled by adequate protective lighting. Give your plant the protection of a complete lighting system.

GENERAL ELECTRIC

451-161

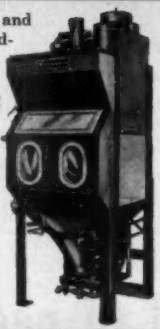
Here's BIG NEWS

Blast Cleaning Unit is PORTABLE!

Ideal for maintenance and many other jobs, including removal of rust, dirt, scale, etc. Economically cleans large objects like tanks, bridges, structural work before painting. Six sizes, stationary or portable, from.....**$170.00** and up

Hydro-Finish SPEEDS POLISHING!

Removes scale, and directional grinding lines . . . prepares surfaces for plating and holds tolerances to .0001"! Liquid blast reduces costly hand cleaning and finishing of molds, dies, tools, etc. Models from **$1295.00** and up

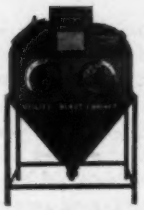


STOP DUST at the SOURCE!

Pangborn industrial type Unit Dust Collectors trap dust at source. Machine wear is minimized, housekeeping and maintenance costs reduced. Solves many grinding and polishing nuisances and material losses. Models from **$286.00** and up

COMPACT Blast Cabinet for SMALL WORK!

Ideal for producing smooth, clean surfaces on pieces up to 60" x 36" in size. Cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Saves money all year 'round. Models from **$315.00** up



Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

Pangborn MAIL COUPON FOR DETAILS

Check for more information

- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Md.

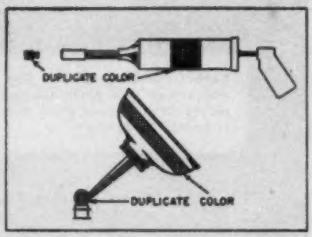
Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....

Company.....

Address.....

City.....Zone....State.....



By simply coloring lubricating equipment and corresponding fittings, your lubricating job will be that much easier

proper lubricant for the particular application. It is then only necessary to see that the color of the grease fitting matches the color on the grease gun or that the oil hole cover matches the color on the oiler.

Outdoor Hoppers Insulated To Handle Fly Ash

Outdoor precipitator hoppers at the Sewaren Generating Station of Public Service and Gas Co. of New Jersey are insulated with mineral wool block to keep fly ash hot, dry and free flowing in freezing weather.

The hot fly ash is stored in hoppers and periodically emptied onto conveyors, dumped into trucks and sold. Without insulation on the hoppers, low outdoor temperatures would cool the fly ash, normally received at 284 F, and produce condensation of moisture. Wet fly ash is heavier, more difficult to handle than when dry and often sticks in the hoppers. Slowdown of the removal process and extra maintenance time are eliminated by the mineral wool jackets.

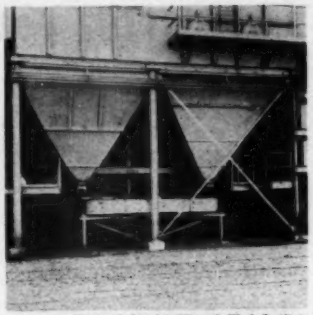


Photo: Industrial Mineral Wool Institute

Mineral wool insulating blocks on outdoor hoppers keep fly ash hot and dry and facilitates handling in cold weather

The hoppers are covered with 1½ in. thick mineral wool blocks in 12 by 18 in. sections. Externally applied, the insulating blocks were placed between lugs which were welded to the sheet metal surfaces on 12 in. centers. To secure the insulation, galvanized iron wires were tightly stretched over the blocks and bound to the lugs. A layer of insulating

Why P&H *Job-Engineered* Cranes mean better service for you

When you buy a P&H Overhead Crane, you buy proved performance. Your crane will be *engineered* to meet the requirements of your specific job — coordinated with P&H electrical equipment, designed . . . not adapted . . . for crane service. There will be ample reserve capacity, adequate service life, maximum safety and every modern operating advantage. All these combine to give you long years of crane service with the least trouble and maintenance cost.

P&H Magnetorque* control for AC cranes brings you one of the most important improvements of the past 20 years. Ask your P&H Sales Engineers about it.

These are Added Values which P&H has learned to put into the building of overhead cranes through 65 years of progressive leadership. Perhaps that explains the overwhelming preference for P&H Cranes.

***T.M. of Harnischfeger Corporation for electro-magnetic type brake.**

P&H

OVERHEAD CRANES

4682 West National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER

Write for your copy of Bulletin C-39 describing P&H Magnetorque Control for AC cranes.

16,000 P&H CRANES SERVE AMERICAN INDUSTRY — FAR MORE THAN ANY OTHER

sleep's unaffected... his factory's protected

Worry! Fret! Loss of sleep thinking about fire cutting into production time... destroying valuable records ... costing lives of employees... all are anxieties of the past when your factory's protected with modern, approved C-O-TWO Fire Protection Equipment.

For example, the new C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems keynote flexibility to meet your particular fire protection needs. Flammable liquids, electrical equipment, storage and manufacturing processes can all be made firesafe from a single low pressure carbon dioxide storage tank . . . capacities range from one to fifty tons of fire killing carbon dioxide. If fire should strike the fast-acting, non-damaging, nonconducting carbon dioxide extinguishes the blaze in seconds . . . no water damage, no lingering odors.

Further, when a C-O-TWO Smoke or Heat Fire Detecting System is used in combination with a C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System, the first trace of smoke or spark of fire in a protected area immediately sounds an alarm . . . then the fire quenching carbon dioxide is readily released into the threatened area.

So, whatever your fire protection problem, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today... tell us about your particular fire hazards, our experience is at your disposal . . . no obligation of course.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

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Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-in High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-in Smoke and Heat Fire Detecting Systems

cement, ¼ in. thick when dry, was trowelled over the blocks and was followed by a ¼ in. thickness of weatherproof finishing cement. Two coats of oil paint finished the installation.

Easy Way to Handle Spring Steel Coils

Contributed by Ernest Baader, Allis-Chalmers Manufacturing Co.

UPRIGHT WOODEN racks about 5 ft high and 4 in. wide have been devised to expedite the handling of coils of spring steel at our plant. The stored steel is from 0.002 to 0.078 in. thick, from 1 to 3 in. wide and from 25 to 200 ft long.

These new racks, with wooden

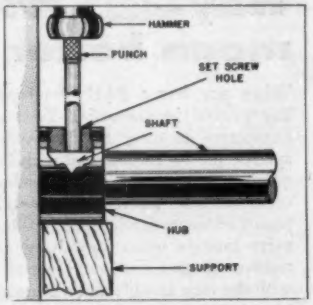
Upright wooden racks simplify storage and the handling of spring steel coils

clamps in front to prevent the steel from uncoiling, are making the job of disbursing steel much easier. A card above each rack indicates type of steel, thickness, width and stock number.

No Shaft Slippage Here

BEFORE applying a set screw to a shaft, sink a depression in the shaft. This can be done with a solid punch having a shank diameter that will just clear the threads in the set screw hole.

Be sure to support the shaft solidly



Placing a depression in the shaft will help to prevent set screw from slipping

KIRK & BLUM FUME CONTROL SYSTEM

60% More Air Less H.P. Lower Cost

at Estate Heatrola Div., Noma Electric Corp. HAMILTON, OHIO

● Although a conventional duct system would have required as much as 100 H. P., this KIRK & BLUM *ductless* Fume Removal System uses just 40 H. P. to handle 160,000 cubic feet of air per minute . . . doing an excellent job of fume removal at lower initial cost and lower operating cost.

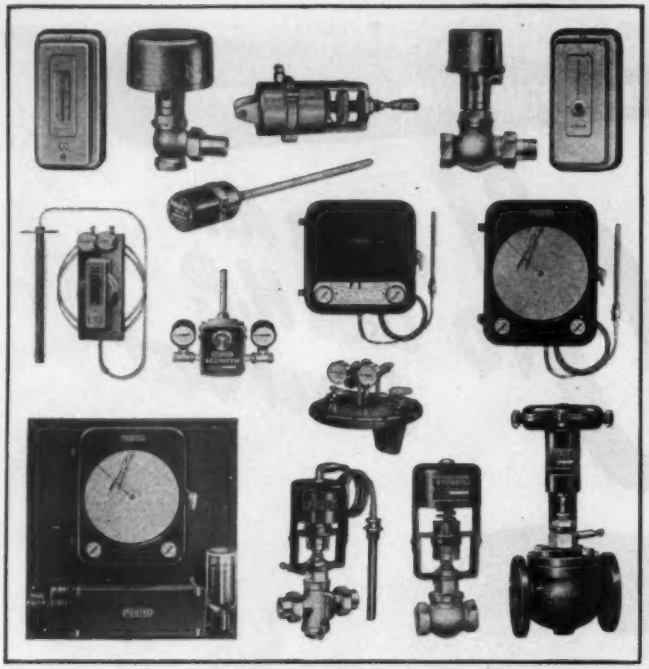
In the plant of this noted stove manufacturer, a battery of ten 8-foot tanks are ventilated by the fume exhaust system shown. Flexibility of capacity is obtained by operation of one or more fans as production requires. Even when baskets containing the parts are lifted from the tanks, the system easily removes all steam and fumes.

Completely designed, fabricated and installed by KIRK & BLUM, this Fume Control System is another example of engineering skill and experience combined to save money for a long list of America's leading plants. For a comprehensive picture of KIRK & BLUM Fume Control Systems, write today for Booklet, "Dust Collecting Systems for Metal Industries".

THE KIRK & BLUM MANUFACTURING CO.
2889 Spring Grove Ave.
Cincinnati 25, Ohio

FOR CLEAN AIR . . . THE [illegible] TOOL

KIRK AND BLUM
FUME CONTROL SYSTEMS



For STABILIZED Heat and Humidity

POWERS

Pneumatic TEMPERATURE and HUMIDITY Control

★ Often Cuts Fuel Consumption 15 to 25%
★ Increases Output of Workers ★ Improves Quality of Many Products

Prevent OVER-heating, save fuel, increase comfort and efficiency of people in heated rooms with a Powers pneumatic system of temperature control. A sound, highly profitable investment for heated and air conditioned buildings.

Constant temperature and humidity conditions in each room can be maintained at any predetermined point with a POWERS system of pneumatic control.

Phone or write your nearest Powers office for an engineer to call and study your requirements for better temperature control. An estimate entails no obligation.

THE POWERS REGULATOR CO.

Established 1891 • OFFICES IN OVER 50 CITIES • See Your Phone Book
CHICAGO 14, ILL., 2746 Greenview Ave. • NEW YORK 17, N.Y., 231 E. 46th St.
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MEXICO, D. F., Edificio "La Nacional" 601 (HAG)

before driving the punch against it, to prevent damage to the shaft or bearings. Only moderate hammer blows should be employed. The depression thus produced will help prevent the set screw from slipping on the shaft.

Hardened Washer De-burrs Holes

Contributed by F. E. Riley

THE SHARP edges can be removed from the ends of drilled and bored holes by means of a hardened washer used in the manner illustrated.

One washer will be suitable for a wide range of hole sizes and a complete set of three will cover most of the holes that can be produced on the average drill press.

Simple way to de-burr holes is accomplished by using case hardened washers

The washers should be thoroughly hardened and have dead sharp edges. Standard steel washers can be used if their diameters are skimmed in the lathe and then case hardened afterwards.

This is a simple yet easy way to de-burr holes and should prove very helpful in solving all your hole-de-burring problems.

How a Crane Truck Removes Snow from Plant Yards

HERE'S AN INGENIOUS-but-practical method of removing snow from plant yards, area-ways, shipping docks. Not only can snow be removed speedily by this application of the crane truck, but special shoveling crews are eliminated, extra snow-

The attachment of the scoop is a comparatively simple operation. In addition to removal of snow the scoop can also be used for handling sand, gravel, coal, earth, waste and other bulk materials

NEW WRINKLE IN GLAZING CUTS COSTS

Sixteen-foot openings in the sidewalls of this building at Midvale Steel Company's Nicetown (Pa.) plant are glazed with corrugated PLEXIGLAS—four 48" x 72" sheets per opening. No steel sash is needed. PLEXIGLAS corrugations match those of the corrugated iron sheeting and economical mounting is achieved by the use of 20-gage sheet iron flashing at top and bottom of windows. Added advantages: Better lighting and better appearance.

PLEXIGLAS Sashless Glazing Ends Window Worries

"How can we improve daylighting without sky-rocketing costs? How can we stop excessive window breakage?" PLEXIGLAS answered these questions for Midvale Steel Company. Tough, shatter-resistant translucent PLEXIGLAS *panels* were installed without sash, and diffused daylight made the building interior even lighter than when window spaces were left entirely open!

Wherever there's a lighting—or breakage—problem, install PLEXIGLAS acrylic plastic. It resists hard blows. Light weight lets you install it easily, safely. And because translucent PLEXIGLAS efficiently diffuses light, you get full, even illumination.

In industrial plants, schools, housing projects and prefabricated buildings, PLEXIGLAS pays for itself in replacement-and-maintenance economies. We'll be glad to send you full information. Write today for complete details about PLEXIGLAS for glazing.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

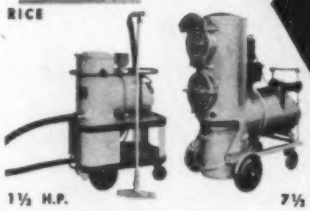
• The supply of PLEXIGLAS available for civilian applications is dependent upon the amount of material required in the national defense mobilization program. Currently, a steadily increasing percentage of PLEXIGLAS production, now at record levels, is subject to defense order priority.

PLEXIGLAS is a trade-mark, Reg. U.S. Pat. Off. and in principal foreign countries.
Canadian Distributor: Crystal Glass & Plastics, Ltd., 54 Duke Street, Toronto, Ontario, Canada.

SPENCER VACUUM IN *Food and Chemical* INDUSTRIES

for CONVEYING • INSECT CONTROL • PACKAGING PRODUCTION • RECOVERY SANITATION

RICE



1½ H.P. 7½ H.P.

CHEMICALS

The time required for moving, cleaning, sorting and packaging valuable foods and chemicals has been materially reduced by Spencer Vacuum. Rice and powdered chemicals are handled by the ton. Excess powdered sugar is recovered from chocolate candies, the insect hazard removed at its source and the entire plant made continuously sanitary as an extra dividend, with the same Spencer machine.

Large areas, inaccessible spots in machines and tanks, above pipes and behind radiators are cleaned quickly with powerful vacuum tools. A Spencer size and vacuum tool for every purpose, including offices, boiler rooms and warehouses. Ask for the Bulletins.

427-A

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

removal equipment and operators are not required, and another use for existing plant equipment is found.

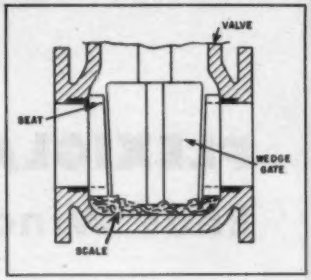
Construction of the snow-shoveling attachment is simple. The unit comprises a large welded-steel scoop, and a rig for mounting the scoop to the truck.

The rigging comprises a structural-steel A-shaped element, two lengths of chain, and a piece of iron pipe.

The A-shaped element is pinned, at the narrow end, to the base of the boom of the crane truck. The scoop is pinned between the legs of the "A". The chain, with the pipe used as a spreader, supports the A structure and scoop from the top of the boom.

In operation, the boom of the Yale truck is lowered until the scoop rests on the ground, and the truck moves forward until the scoop fills with snow. The boom is lifted to lift the bin, and the truck swings or transports the load to the dumping area. To dump, the crane-hook, which is engaged with an eye welded to the back of the bin, is raised and the load is emptied.

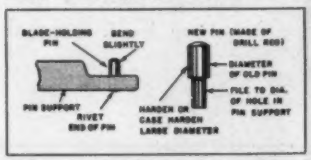
Position Your Gate Valves



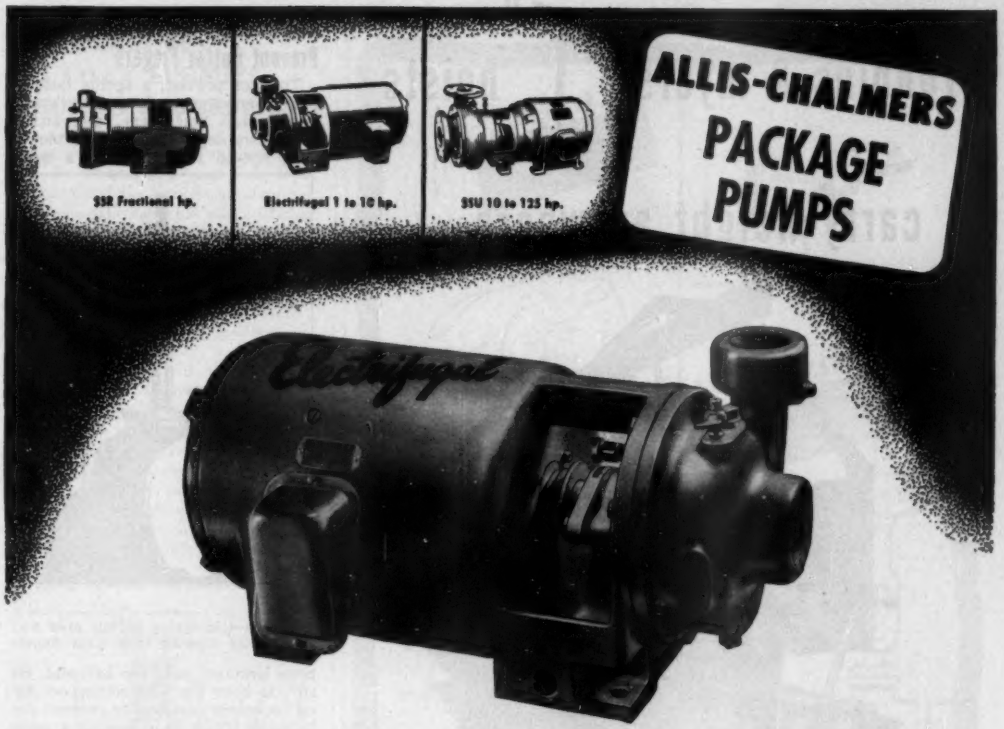
Place gate valves upside down or horizontal in horizontal lines rather than in the usual vertical position. This will prevent the possibility of scale and sediment accumulations settling between the seats, as shown in sketch

Hacksaw Frame Repair

WHEN THE blade-holding pins of a hand hacksaw frame wear excessively or break, new pins of a longer-wearing type may be substituted. The part of the pins that projects is hardened or case hardened while the smaller diameter section is left soft for riveting.


BLADE-HOLDING PIN
BEND SLIGHTLY
NEW PIN (MADE OF DRILL ROD)
DIAMETER OF OLD PIN
FILE TO DIA. OF HOLE IN PIN SUPPORT
PIN SUPPORT
RIVET END OF PIN
HARDEN OR CASE HARDEN LARGE DIAMETER

Hardened hacksaw pins give longer wear



Competent Installation Engineering Puts Extra Value Into This Pump

BUYING A GOOD PUMP is important in keeping pumping costs low. But correct selection and installation is equally important. That is why every Allis-Chalmers pump representative is a skilled application engineer who gives you more value for your pumping dollar by selecting the right pump for your needs.

He takes into consideration not only your immediate needs but your probable future needs. He looks over your whole pumping system and may be able to suggest changes that mean substantial savings in cost per gallon pumped.

Since he has a very wide range of centrifugal pumps from which to choose, he offers you exactly the right pump for your needs in either close-coupled or pedestal-mounted styles.

When you have a pumping problem, call the Allis-Chalmers representative in the planning stage. He will be glad to help you work out a complete pumping system that will give you lowest cost per gallon pumped over the years.

For information on the complete line of Allis-Chalmers pumps, ask for Bulletin 52B6059. A-3222

Allis-Chalmers
Milwaukee 1, Wis.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

Texrope, *Vari-Pitch* and *Electrifugal* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

robbins & myers "J" hoists

carry weight anywhere...

widen markets for Howe Scale company

Here's a time and money-saving hoist that really gets around. The Howe Scale Co., Atlanta, Ga., uses this special truck, with an R&M "J" hoist, to convey twelve 500-lb. test weights to check and service industrial scales throughout the southeastern states. The driver merely connects a drop cord to nearest electrical outlet, uses standard push-button pendant control to operate hoist, loading or unloading two 500-lb. weights at a time. Operator effort is minimized. More customers are served per day. And Howe Scale now covers a wider-than-ever service area.

R&M "J" hoists are ideal for the job: rugged, simple, low on maintenance, long on performance. If you have a weight-lifting problem of any kind, an R&M hoist or crane installation—engineered to your job requirements will help conserve manpower, increase productivity, and pay a higher return on your total equipment investment. Your nearest R&M field engineer is always at *your service*. Write for Bulletin P31E.

TAKE IT UP WITH

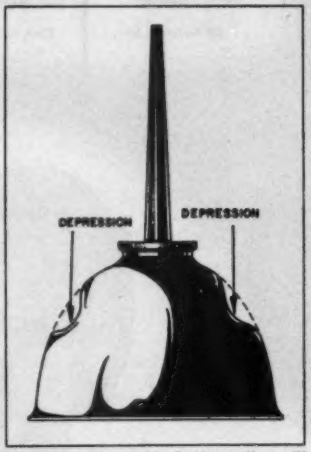
ROBBINS & MYERS

MOTORS HOISTS CRANES FANS MOYNO PUMPS

HOIST AND CRANE DIVISION, SPRINGFIELD 99, OHIO

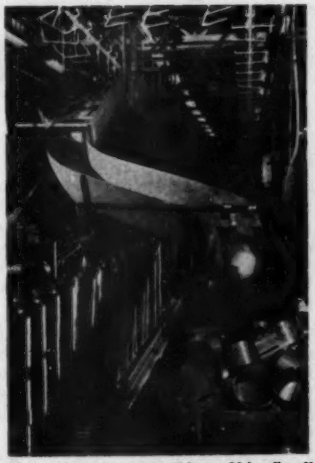
Oiler Grips Help to Prevent Butter Fingers

To HELP prevent a spring bottom oiler from slipping from fingers and falling into machinery, carefully make two depressions in the metal. This should be done with a ball-peen hammer, usin the ball end. Be sure to have the oiler setting solidly on its bottom surface, to prevent the hammer blows from forcing a seam open.



Depressions in spring bottom oiler will prevent its slipping from your fingers

Gravity Helps in Small Motor Manufacture



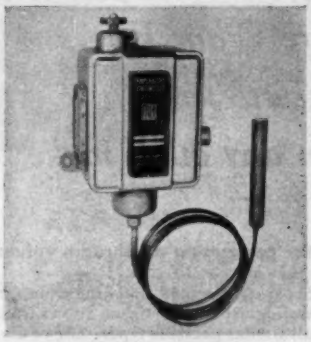
Motor frames at the Lima, Ohio, Small Motor Division plant of Westinghouse are carried from the point of fabrication to the point of use on an overhead conveyor with special hangers. When the frames reach the proper point, they are automatically removed from hangers, tumble into waiting receptacle

C. B. CLAIR OF ELI LILLY SUBMITS WINNING SUGGESTION

A diagram and description of the utilization of a Honeywell Remote Bulb Temperature Controller for non-critical control of an automatic valve has won a *Chronotherm*, electric clock thermostat, for Mr. C. B. Clair, Eli Lilly's Chief Instrument Engineer, at Indianapolis.

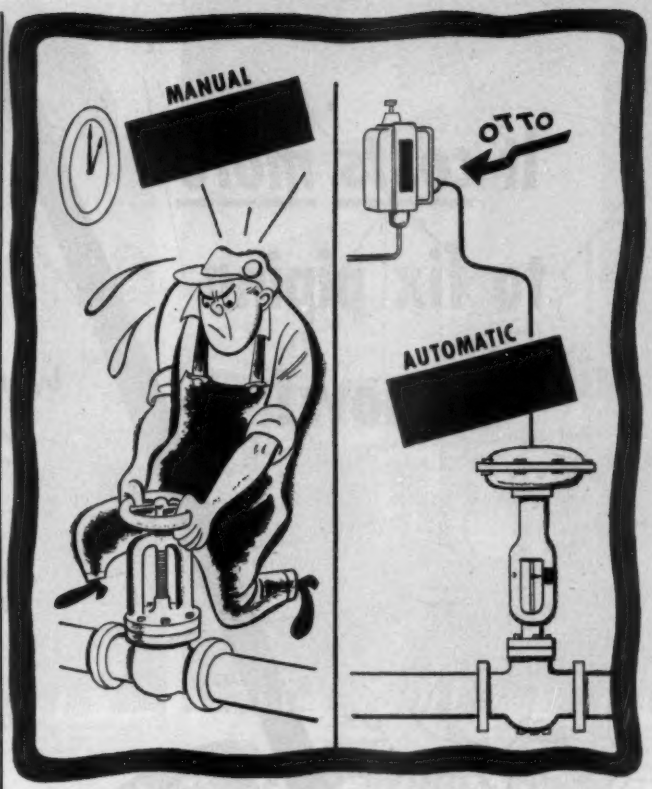
This Honeywell Automatic Control, one of the thousands available to industry, replaces the frequent and inconvenient operation of a hand valve . . . and maintains the temperature within the limits required for the application.

The Minneapolis-Honeywell Regulator Company lists more than eight thousand industrial automatic controls for temperature, pressure, humidity and combustion safety . . . for fluids, gases and electrical circuits. They are broadly classified by consideration of the medium through which control is secured . . . electronic, electric, pneumatic, and a combination of electric and pneumatic. The types of control available include On-Off, Two-Position, Floating and Proportional.



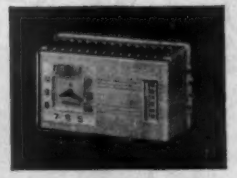
Non-Indicating Temperature Controller

Mr. Clair's winning a *Chronotherm* is part of the contest currently being conducted by the Industrial Division of Honeywell. A similar award is offered to production and maintenance men who submit descriptions of the most practical applications for the company's non-indicating and non-recording industrial controls. According to a release from the company, anyone whose position qualifies him for entrance in the contest should send his suggestion to MINNEAPOLIS-HONEYWELL REGULATOR CO., Station 70, 4491 Wayne Ave., Philadelphia 44, Pa. The same address may be used to secure the monthly application bulletin and a copy of Catalog 8304 which contains detailed information on a representative group of the complete line of Honeywell Automatic Controls.



DOES "otto" WORK FOR YOU?

Tell how—Win a
HONEYWELL CHRONOTHERM ELECTRIC CLOCK THERMOSTAT



"Otto Matik" is the symbol of the thousands of products in the complete line of Honeywell Automatic Controls. "He" is probably at work right now in your plant. Send us a sketch and description of what he is doing . . . an impartial board of judges will rate it in terms of its importance to the maintenance of plant operation. You may win a *Chronotherm* . . . Honeywell's famous home thermostat!

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* 4491 Wayne Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

Honeywell
BROWN INSTRUMENTS

It costs more to fix piping now!

No. 1615 Diaphragm Valve
Iron Body, Neoprene lined

You do less fixing

by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

better performing diaphragm valves

Separate disc and diaphragm design distinguishes these Crane Valves from all similar packless types. Life of diaphragm is multiplied because it's used only to seal the bonnet—not for seating. The separate disc seats the valve, eliminating wear and tear on the diaphragm.

Increased flow capacity... reduced flow resistance... tighter seating... lower torque and fewer turns to operate... are typical added features of Crane Diaphragm Valves. Wherever you use them, you can be sure of outstanding performance.

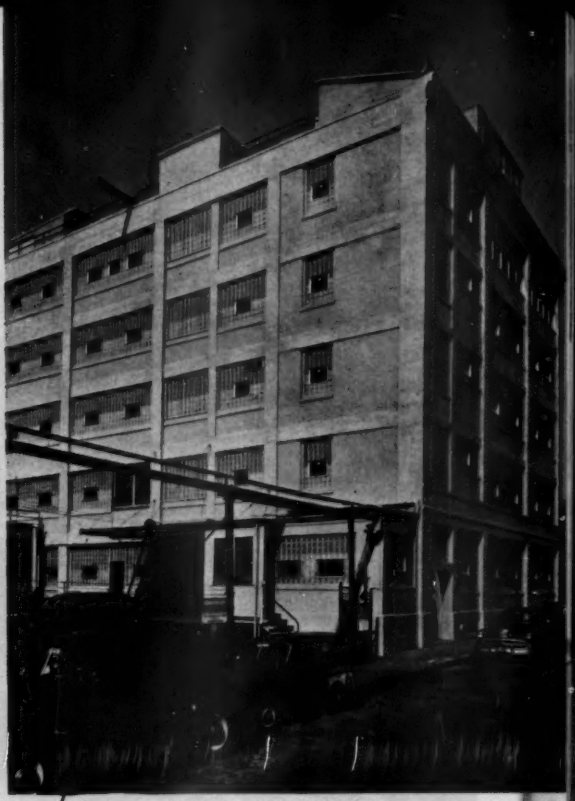
Such better quality and greater dependability mark Crane valves and fittings of every type—and assure the lowest ultimate cost.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

One of Polaroid Corporation's buildings in Cambridge, Mass., before old, deteriorated sash and windows were replaced with an Insulux Fenestration System.



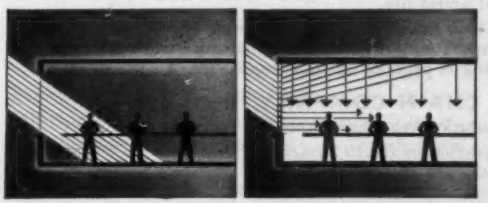
Polaroid Corporation building, Cambridge, Mass., after sash replacement with Insulux Fenestration based on Daylight Engineering principles. Contractor: W. F. Cannon Company, Boston, Mass.

BEFORE Daylight Engineering

AFTER BEING Daylight Engineered

YOU GAIN in many ways when you install an Insulux Fenestration System based on Daylight Engineering principles.

Look at the pictures above. Same building, same basic design. But what an improvement! The handsome walls of Insulux glass block also provide thermal insulation equivalent to 8 inches of brick. Outside noise is silenced. The installation is permanent because Insulux glass blocks neither rust nor rot, and are extremely difficult to break. Maintenance costs dwindle.



Direct sun causes uncomfortable brightness near windows, extreme contrast in other parts of room. Insulux Fenestration directs and spreads daylight to ceiling, keeps brightness at comfortable levels.

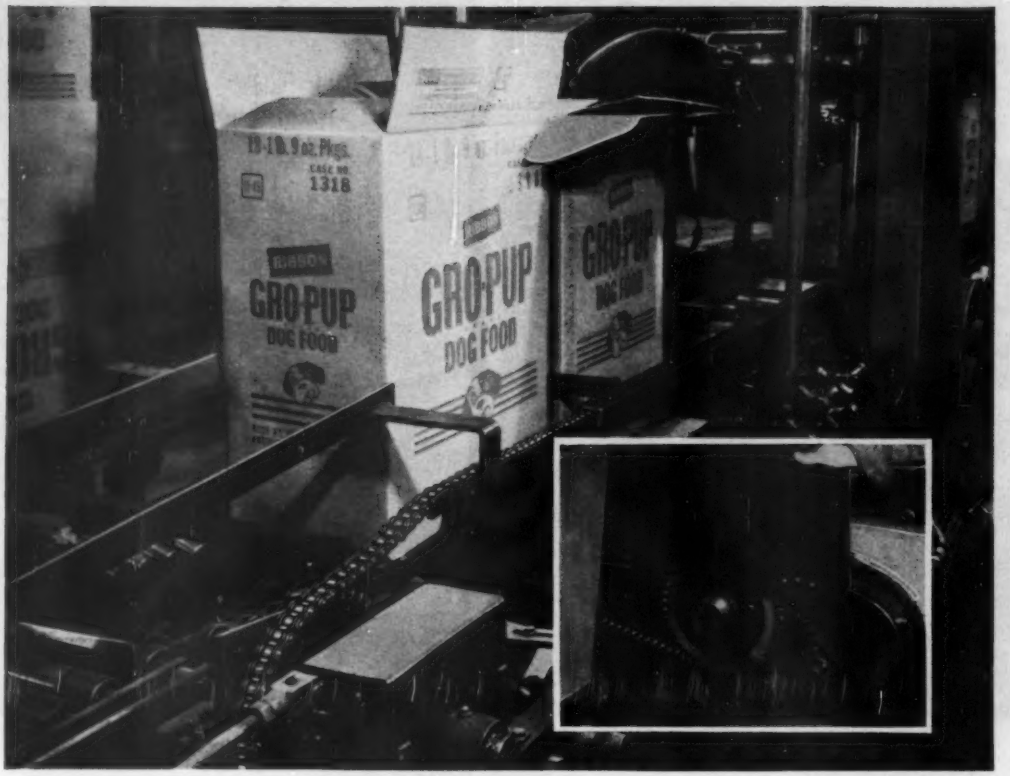
More than that, the new Number 363 light-directing Insulux glass block pick up rays of light, morning, noon and afternoon, direct them to the ceiling where they are evenly reflected to working areas. It is just as though the building turned with the sun. Employees benefit from good seeing, feel less fatigue.

Find out what Daylight Engineering can do for your buildings. Just write the Daylight Engineering Laboratory, Dept. P.E.3, Box 1035, Toledo 1, Ohio. Insulux Division, American Structural Products Company, subsidiary of Owens-Illinois Glass Co.

INSULUX GLASS BLOCK

INSULUX FENESTRATION SYSTEMS

—by the pioneers of Daylight Engineering



Speeding GRO-PUP TO MARKET with DIAMOND ROLLER CHAINS

Catalog 709 includes complete data on Stock Sprockets and Roller Chains. Copy mailed on request.

● For the driving of machinery from motors to main drive shafts—from shafts to shafts—or as important members of conveying and packaging equipment, Diamond Roller Chains serve in plants throughout the land . . . Rolling at every point of contact, they operate with frictionless ease, transfer power without slip at 98-99% efficiency for years of useful life.

Diamond, the No. 1 Roller Chain since 1890, provides the reliability so important in the present day race to speed output and hold maintenance and operating costs down. Catalog 709 containing 48 pages of valuable data is yours for the asking.

DIAMOND CHAIN COMPANY, Inc.
Dept. 614, 402 Kentucky Ave., Indianapolis 7, Indiana
Offices and Distributors in All Principal Cities
Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

Rome RoZone

THE PREMIUM QUALITY OIL-BASE INSULATION

adds years to cable life...

Photo, courtesy of Ingersoll Milling Machine Co., Rockford, Ill.

Unretouched photo of RoZone specimen after long-time ozone test

Unretouched photo of conventional rubber specimen after short-time ozone test

ROZONE INSULATION POSSESSES

- High dielectric and impulse strength
- Excellent resistance to corona and ozone cutting
- Remarkable electrical stability in water
- Inherent resistance to aging, heat and sunlight

Where urgent production depends upon unfailing power, you will be far ahead by first making sure of the quality of your power distribution system.

If you have a plant wiring problem where conditions are tough and dependable performance a must . . . then RoZone-RoPrene, with protective RoPrene sheath is your answer. RoZone, an oil-base insulation of exceptionally high quality, has long-time aging characteristics, while RoPrene (Neoprene) provides maximum resistance to oils, chemicals, sunlight and flame. RoZone-RoPrene is a "natural" for paper mills, chemical plants, steel mills . . . any industrial application where quality and long life are paramount.

RoZone-RoPrene is available as single or multi-conductor for service ratings up to 8000 volts in a complete range of sizes. It may be installed direct in earth, in conduit, on open racks or trays . . . or, in circuits combining all three.

The new Rome Power and Control Cable Catalog will show you why it pays to specify Rome RoZone. Mail the coupon below today!

IT COSTS LESS TO BUY THE BEST

ROME CABLE CORPORATION, Dept. PE-3, Rome, N. Y.
Please send a copy of new Rome Power and Control Cable Catalog.

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From Bar to Finished Wire

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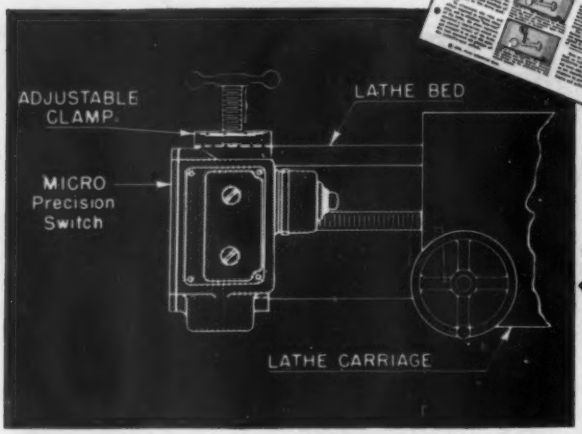
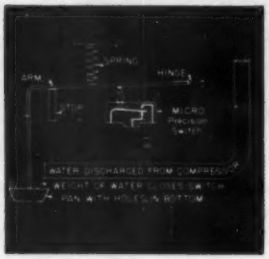
"MICRO TIPS" is full of ideas like this



While there are many ways to install adjustable limits on lathes, shapers and similar machines, this sketch shows how one plant engineer did this by mounting a snap-action switch on an adjustable bracket.

Snap-action switches are used to prevent possible jamming on screw-jacks of large presses. The switch is installed to open the control circuit of the ram motor before it screws the jack to the last few threads.



A snap-action switch assures safe operation of a water-cooled compressor. It allows the compressor to run only if the cooling water is being discharged.

MICRO . . . first name in precision switches

With new machinery hard to get, plant engineers, electricians and maintenance men find MICRO TIPS a veritable gold mine of information on how snap-action switches revitalize present equipment.

All the ideas published in MICRO TIPS are available to you for adaptation to your use. They show you how other plant men have used MICRO precision switches to improve product quality, lower production costs, make machines automatic, increase production and protect equipment, products and personnel.

These are time-tested practical ideas sent to MICRO TIPS by plant engineers and maintenance men in every phase of industry. Get on the mailing list for MICRO TIPS today.

MICRO SWITCH distributors with complete stocks are located in over 100 cities to serve you. Look in your classified phone book.

Copr. 1951 Minneapolis-Honeywell Regulator Co.

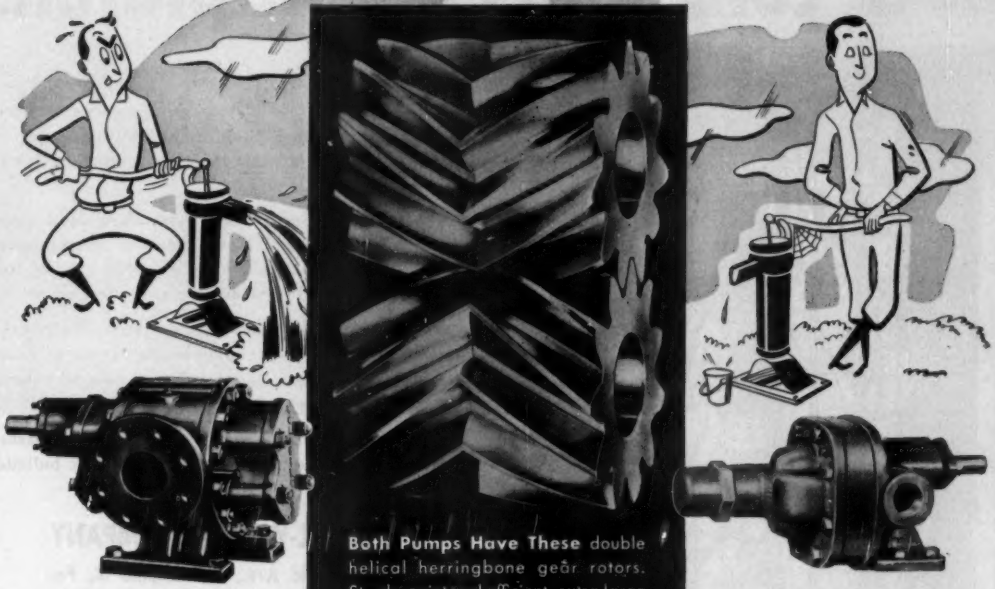
MICRO SWITCH

FREEPORT, ILLINOIS

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

Whether you're pumping

a lot . . . or . . . a little



TYPE GR ROTARY PUMP
Up to 5000 gpm and 500 psi

Both Pumps Have These double helical herringbone gear rotors. Sturdy, quiet and efficient; extra large wearing surfaces; no axial thrust; no trapping of liquid.

TYPE GA ROTARY PUMP
Up to 50 gpm and 100 psi

You can't beat this pair for ruggedness!

Or for trouble-free performance either — because, husky as they are in every detail of construction, they're the smoothest-pumping rotaries you ever hooked up! Both the heavy-duty Type GR and the light-duty Type GA have the special herringbone rotors that handle the widest range of liquids—hot or cold, thin or viscous—with steady, quiet efficiency. And each, in its own capacity range, is the soundest investment you can make for years of dependable, low-cost pumping service . . .

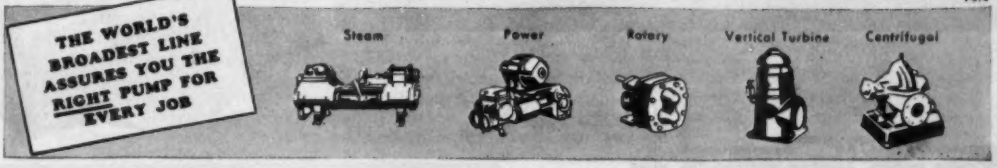
Get proof that *there's more worth in Worthington.* Write for further facts about these pumps to *Worthington Pump and Machinery Corporation, Reciprocating Pump Division, Harrison, New Jersey.*

MEMBER

WORTHINGTON

P0.4

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB



HOTTER, SOONER steam traps.. knock cold spots out of platens

Cold spots in press platens at this large western plywood plant are a thing of the past since they've installed the steam traps that get equipment *hotter, sooner*—Yarways.

Yarway Impulse Steam Traps never allow condensate to accumulate and pull down working temperatures. They discharge the condensate *as fast as it forms.* Result—equipment always operates at highest efficiency.

Couple this fact with other features like small size, easy installation, only one moving part, non-freezing, good for all pressures, low cost—and you know why more than 650,000 Yarway traps have already been installed.

Try a Yarway *for free* in your own plant. Your nearest distributor will supply it. For name, or free bulletin write to . . .

YARNALL-WARING COMPANY
145 Mermaid Ave., Philadelphia 18, Pa.

Stainless Steel Body

YARWAY **IMPULSE STEAM TRAP**

At left: photo of one session of Plant Maintenance Conference. Above: At first general session, L. C. Morrow, Chairman; Wm. A. Perry, Asst. Gen'l Supt. Services, Inland Steel Co., East Chicago, Ind.; J. E. Gramlich, Asst. Supt. in Charge of Field Depts., Eastman Kodak Co.; B. J. Beitman, Maintenance Analysis Expert, The Goodyear Tire & Rubber Co., Akron, Ohio; and B. M. Werly, Supt. of Shops and Field Depts., Eastman Kodak Co., Rochester

Plant Maintenance Conference Packs 'em In

THE first Plant Maintenance Show and Conference was introduced last year in a period of uncertain world and domestic conditions. This year the bouncing baby seemed to know where he was going and why it was necessary to go there. Spurred on by predicted shortages in manpower and materials, plant engineers and others vitally interested in maintenance poured into the Cleveland Auditorium to the tune of more than 10,000 registrants in the four-day period.

Reflecting another phase of accelerated interest in industrial activity the exhibits increased in number over last year to a great degree. There was, in fact, a 250 per cent increase in exhibit floor space. More visitors were present and the general air of activity pointed to the fact that maintenance, both preventive and repair, was due to take its rightful place in industry economics.

Conference program sessions increased numerically 100 per cent over last year. The time allotted to the conferences was the same as last year but, by conducting two groups of concurrent sectional conferences, four conferences at a time, it was possible to direct the subjects and activities into channels of paramount interest to each man present. For example, the first four sectional conferences were broken down by job interests into these groups: Maintenance of Electrical Equipment; Maintenance of Power Plant and Heating Equipment; Maintenance Problems of the Small Plant; and Selection and Maintenance of Lighting Equipment.

The second group of four sectional conferences was divided industry-wise; the first was on Maintenance in Chemical Plants; the second, Maintenance in Paper and Paper Products Plants; the third covered Maintenance in Food Processing Plants; and the last, Maintenance in Metal-Working Plants.

A highlight of the Conference was the Plant Maintenance Banquet held the evening of January 17 in the ballroom of the Hotel Cleveland. Speaker of the evening was Herman W. Steinkraus, President of Bridgeport Brass Co., Bridgeport, Conn. Mr. Steinkraus, speaking on the subject "What National Defense Means to Plant Operation," told the group that in America lies the means and methods of keeping a free world free. The plant engineer and the other members of the plant engineering staff, said Mr. Steinkraus, are key men in this nation's fight for survival.

The Third Plant Maintenance Show and Conference, according to Saul Poliak of the Show Management, will be held in Philadelphia, January 14 through 17, 1952.

By G. S. KETTER, Electrical Engineer, Engineering Division, The B. F. Goodrich Co., Akron, Ohio. Presented at the Plant Maintenance Conference, Cleveland

Selection and Maintenance of Lighting Equipment

TECHNICAL DETAILS of a lighting system design are only a partial solution to the problem of satisfactory lighting; and installation of the system is only the beginning, for numerous factors contribute to its rapid depreciation. The most important of these factors are: Loss of light output due to lamp depreciation; Accumulation of dust and dirt upon the lamp and fixture; Discoloration and fading of paint or room finish; Loss of light output due to low voltage.

In the design, a plan should be made to clean and service the equipment and a schedule of adequate maintenance should be indicated There are only a few things which can be done to maintain lighting equipment and we have found the major ones to be:

Keep lamps replaced. The output of all light sources diminishes with use and in many cases it is economical to replace lamps before they finally fail. With planned lamp replacement schedules, savings may be realized by replacing groups of lamps rather than individual ones, thus depreciated lamps are replaced by those of peak performance.[1] In certain specific applications where color matching of fluorescent tubes is important, group lamp replacement offers the only solution. Since identical types of fluorescent tubes on which different lengths of burning time have been accumulated will appear as different colors, it is obvious that replacement only at burnout will not be satisfactory.

Keep lamps and fixtures clean. Lamps and fixtures collect dust and dirt which reduce lighting efficiency. The rate of depreciation is dependent upon the atmospheric conditions and the type of lighting system employed. A thorough cleaning of lighting equipment at least twice a year is usually justified economically in favorable locations. Under adverse conditions, three or four cleanings are needed to achieve the lowest cost of operation in terms of foot-candle hours per dollar. With proper cleaning schedules, an increase of at least twenty-five per cent is often realized in the average maintained value of illumination.

Keep surrounding reflecting surfaces clean. The necessity for cleaning or painting room surfaces is also a function of the amount of dirt contained in the atmosphere and, depending upon the type of lighting system employed, has a varying degree of importance in the average maintained value of illumination. Lighting losses can be kept at a minimum and improvements in brightness ratios can be obtained by the proper selection of light colored finishes on ceilings, walls, machinery, furniture and flooring and other reflective surfaces.

Keep lighting equipment in operating condition mechanically and electrically. Maintain auxiliary equipment, fixture parts and electrical circuits. Overloading of circuits cause voltage drop which results in decreased light output. Over-voltage will cause decreased lamp life. Wide voltage fluctuations result in a combination effect of decreased light output and decreased lamp life and should be corrected by voltage regulation.

Lighting systems which are adequate in installation will rapidly depreciate if not properly maintained. Maintenance should be based upon a regular and systematic schedule and should include a system of reports and checks. When the illumination decreases to seventy-five per cent of its initial value, the equipment should be cleaned. Group replacement of lamps based on an operating schedule should be used, particularly in production areas where replacement is difficult and time-consuming due to interference.

One of the best ways to obtain good maintenance is to make maintenance easy. To determine the depreciation characteristics of two different type fixtures which were being considered for a large scale office installation at The B. F. Goodrich Company in Akron, Ohio, a six month test program was conducted. Both fixtures were of the four-40 watt fluorescent type. One type was glass bottom and glass side panels and the other type was louver bottom and glass side panels. Total loss in foot-candles for the louver bottom fixture was 19.5 per cent; for the glass bottom fixture it was 27.8 per cent.

The loss at 25 per cent life for the louver bottom fixture, due to dirt, was 2 per cent; at 75 per cent life the loss was 7.5 per cent. For the glass bottom fixture the loss at 25 per cent life was 7 per cent; at 75 per cent it was 23.5 per cent. Obviously, the louver bottom fixtures were used for the installation in Goodrich offices.

A particularly irritable source of trouble in office type fluorescent fixtures is the collection of dust and dirt upon the translucent side panels of the fixtures. Static charges collect on the plastic side panels and as a result, dust and dirt particles are attracted to it from the air. This condition is particularly bad in a rubber plant where all surrounding air is filled with minute particles of carbon black. This dirt has an unreasonable habit of collecting non-uniformly, and as a result, the side panels seem dirt-streaked or fingerprinted. Glass side panels could be used but offer added disadvantages in accident hazard, weight and cleaning.

For styrene side panels, this situation can be overcome by the use of a special liquid coating applied at the time of manufacture or assembly by wiping with a clean rag immersed in the liquid. This liquid apparently de-staticizes the plastic by insulating it, thus preventing the uneven ac-

[1] See "Plant Lighting—Its Cost and Maintenance" by R. M. Smart, June, 1950, PLANT ENGINEERING.

cumulation of dirt and offering a satisfactory solution to the problem. The applied film will last for years, providing it is not completely removed by wiping with a water wet rag or by dipping in water. It is suggested that the panels be maintained between washing by dry brush, vacuum or dry rag wipe. After periodic washings of the fixtures, the special liquid should be re-applied in the same manner as the original treatment.

Poor fixture design has doubtless caused untold grief among maintenance personnel. In a study and survey of office type fluorescent fixtures representing many different manufacturers, the following objectionable items were observed:

Removal of louvers and wiring cover necessary in order to replace or reset starters.

Removal of lamp necessary in order to replace or reset starters.

Removal of side panels necessary in order to replace lamps.

Removal of louvers necessary in order to replace lamps. This type of design results in the expenditure of wasted time and rapidly becomes expensive in the maintenance of the lighting. It cannot be tolerated when by proper selection and design it can be overcome.

Use of the single pin fluorescent lamp offers maintenance advantages because fixtures equipped with this type of lamp are undoubtedly easier to re-tube and would also involve less socket maintenance. Selection of this type of lamp for installation in areas where large numbers of bi-pin lamps are used must be weighed against the stocking and handling problem of an additional type of lamp.

It is possible to effect economies by carefully analyzing the operating schedules and observing the normal habits of certain departmental areas. In some places, it is normal procedure to turn lights off during shift changes or some other small periods of inactivity in order to save power. This is false economy since the shortening of the lamp life usually offsets the savings effected. To prevent unnecessary switching on and off of large groups of lights for night cleaning operations, the additional cost of special, marked circuits for cleaning may be justified.

At The B. F. Goodrich Company in Akron, industrial type fluorescent fixtures installed in factory areas are of the disconnect type. The installation consists of a twin-40 watt fixture suspended by two conduit stems. The ceiling conduit branch feeder supports the stems and includes "C" fittings which are equipped with a one-hole cover for the fixture cord. The cord is run down through one stem and terminates at the top of the fixture in a female cord connector. A surface mounting male motor plug is installed in the top of the fixture. Fixture loops are provided at the top of the conduit stems and at the top of the fixture. Fixture hangers are installed at the bottom of the conduit stems.

This method of installation allows easy removal of the entire fixture. Removal is simple and a one-man operation. Pull the plug on the top of the fixture and lift the fixture off the two loops. The conduit stems and fixture cord remain hanging in the air and a complete replacement fixture can be installed. The defective fixture can be returned to the shop where it can be repaired at some convenient time rather than making the repair in the air and in the middle of a production area. Twin-100 watt fixtures are installed in the same manner.

It will be noted that the fixtures are free to be relocated laterally along the supporting conduit run, a flexibility not obtained if the conduit stems were installed in "T" fittings or other screw-type hangers. This offers advantages when production areas are ararnged or when a different type of work involving different areas is introduced.

Much of the incandescent factory lighting at the Akron plants of The B. F. Goodrich Company consisted of drop cords using an RLM reflector. Over a period of years, these drop cords are being replaced by mounting the fixture on a conduit stem which is provided with a hook-type disconnect device mounted on the ceiling and a socket and plug for the fixture cords which are also mounted on the ceiling rather than permanently connecting the cord to the ceiling branch feeder. This type of installation offers multiple benefits: It allows easy replacement of the entire fixture; bulbs can be replaced using the stick; it is safer. Past experience has shown that drop cords become brittle after a number of years and being subject to wind currents and swinging, may break off, resulting in a serious accident.

Cleaning Forced Changes

The excessive cost of cleaning reflectors in dirty locations, especially in mill rooms with high ceilings, has made the use of reflector and projector type lamps very attractive. These lamps with built-in reflectors are rated at 1000 hr life and the reflecting surface is just as clean at the end of its life as it was at the time of original installation. No cleaning of any kind is necessary with this unit, since the lamp is replaced by the time the outer surface becomes dirty enough to seriously obstruct the light output of the lamp.

For most applications, the flood-type lamp works out most satisfactorily but there are special conditions where the concentrated beam of light from the spot-type lamp may be desirable. It should be noted that design of installations equipped with this reflector-type lamp should take into consideration the problems of contrast in the upper portion of the room if long conduit stems are used, since no light escapes upward.

Another location where the reflector-type lamps are being used to reduce maintenance cost, including cleaning cost, is over storage areas where materials are piled ceiling high and where permanent aisles are maintained. We have found that the usual symmetrical pattern of lighting units with porcelain reflectors located over the entire floor area could not be satisfactorily maintained even at an excessive cost, since it is usually impossible to get to the lights for relamping and since the storing of materials usually result in abnormal damage to the lighting equipment. We have used vertical suspension of reflector-type lighting units successfully in this type of installation for aisle lighting and have had satisfactory results for the storage areas by using reflector-type lamps mounted at an angle and aimed directly at the stored material.

Lamp Replacement

Lamp replacement in the Akron plants of The B. F. Goodrich Company is done only on request of the using department. Upon observing a number of burned out lamps in his department, a foreman calls the electric shop and requests replacement. These calls are accumulated and relayed to the lamp replacement man. Two men on each shift do nothing but replace lamps. Upon replacing the lamp, if something else is wrong with the fixture or for some reason the light does not burn, the lamp replacement man reports it.

In the lighting program for the rehabilitated general office area at the Akron plants, it is possible that group replacement of lamps must be adopted in order to maintain color matching of tubes. This is especially important where the aesthetic appearance of the general lighting is a major factor in the environmental surroundings and is particularly noticeable where fixtures are mounted in continuous rows.

Cleaning of lighting fixtures in manufacturing areas in the Akron plants is done only on request of the using department. The foreman of the using department requests the cleaning of his lights by the issuance of a general purpose order, authorizing the work to be done by the plant cleaning department. The fixtures are removed by electricians, washed by the plant cleaning department, and replaced by electricians. Some arrangement setting up a regular schedule of fixture cleaning would probably give better results, but there is nothing to prevent the user from requesting that his fixtures be cleaned as frequently as he desires.

When a new department is set up

(Continued on page 92)

By D. G. JAMIESON, Assistant Plant Engineer, Canadian Synthetic Rubber Limited, Sarnia, Ontario, Canada. Presented at the Plant Maintenance Conference, Cleveland

Planning and Scheduling Maintenance Operations

THE EFFICIENCY of any maintenance organization must be judged largely by the percentage downtime of equipment due to maintenance requirements. The obvious way to insure minimum downtime is to plan and schedule a program accordingly. It is certainly impractical to plan when a piece of equipment is going to fail. Therefore, in order to control downtime, equipment must be scheduled for service before a breakdown occurs. In other words, a preventive maintenance policy is established. PM, as it is commonly known, is the modern way of planning and scheduling most maintenance work.

A few years ago we adopted a preventive maintenance policy at Canadian Synthetic Rubber Limited, and we now feel that we have a system which is simple, adequate, and requires a minimum of paper uling most maintenance work in any plant.

Our Engineering Division, headed by a Plant Engineer and an assistant primarily concerned with maintenance, is divided into four departments: design department which is headed by a design engineer; clerical department which is headed by an engineering clerk; mechanical maintenance department which is headed by a mechanical foreman; instrument and electrical department which is headed by an instrument and electrical foreman.

The engineering clerk is responsible for all clerical functions in the maintenance departments. He maintains close liaison with both accounting and purchasing departments. He is able to provide, on short notice, up-to-date costs on any job, or delivery schedules for materials required by the engineering division. He initiates all outside material requisitions for the division and receives this material. He is responsible for assigning the correct charge codes on all work orders, and feeding charges from these work orders back to the accounting department. He obtains proper authorization on all work orders and makes out and distributes trade copies. He sets up all file and records systems for the maintenance departments, and sees that new equipment is fitted into the existing system for spare parts, PM schedule, drawings, etc.

The mechanical foreman has an assistant and four sub-foremen, two over millwright groups, one for a fitter group and one for a building trade group. The instrument and electrical foreman has two sub-foremen, one over the instrument mechanics and one over the electricians.

These foremen are responsible for maintaining the plant and equipment under their jurisdiction. They see that new installations, either by their own forces or outside contractor, are up to specifications and standards. They are responsible for setting up and maintaining the PM frequencies; for allocating their manpower according to policy; for analyzing maintenance work order costs and suggesting ways of reducing them; for scheduling the forces to best advantage, and for providing estimates for all normal work orders. They also act as field consultants for the design department.

Our organization is based on central control. This works to advantage in a plant and force of our size and basically is more easily controlled than area-wise operation, hence generally more productive.

In setting up a scheduling system, one of the first requirements is a suitable method of numbering plant equipment. A well chosen system will lend itself as an index in scheduling work, identifying spare parts, filing records and drawings, or as an entry to any information desired. A common system which we have found to be quite adequate consists of a prefix number grouping equipment into classes, such as pumps, tanks, motors, etc., then individual consecutive numbers to identify each item in the class. For example, 1-235 would be the 235th pump or 10-720 the 720th motor. One manner in which this equipment numbering system is used to advantage is illustrated later in the description of our spare parts catalogue.

A careful manpower and job analysis is essential before maintenance work can be scheduled to full advantage. A definite policy must be established regarding what types of work shall be allowed and the quantity of non-maintenance work to be accepted, as most maintenance departments do minor construction and alterations.

In our case we divided the work into three main classes: Preventive Maintenance, called PM; General Maintenance, called GM; and Minor Construction and Alterations, called MC&A.

For PM requirements, each piece of equipment, or service, was analyzed, and answers supplied to the following questions:

1. How long can we be reasonably certain this item will run efficiently?

2. How extensive servicing do we anticipate it will require at the scheduled frequency?

3. How many man-hours, of what skill, and what trades, will be required?

4. Has provision been made to have anticipated spare parts on hand? (separate analysis).

This type of analysis has been applied not only on mechanical, instrument, and electrical equipment, but also on piping, wiring, building, and every service for which we are responsible. Naturally, not all classes were included at the start. Many of the original estimates and assumptions were necessarily based as much on common sense as on experience. An analysis of this type generally brings to mind work which has been neglected too long. At the comple-

tion of the analysis a figure is available indicating the total man-hours required per trade in terms of 1st Class, 2nd Class Mechanic, etc., for the PM work.

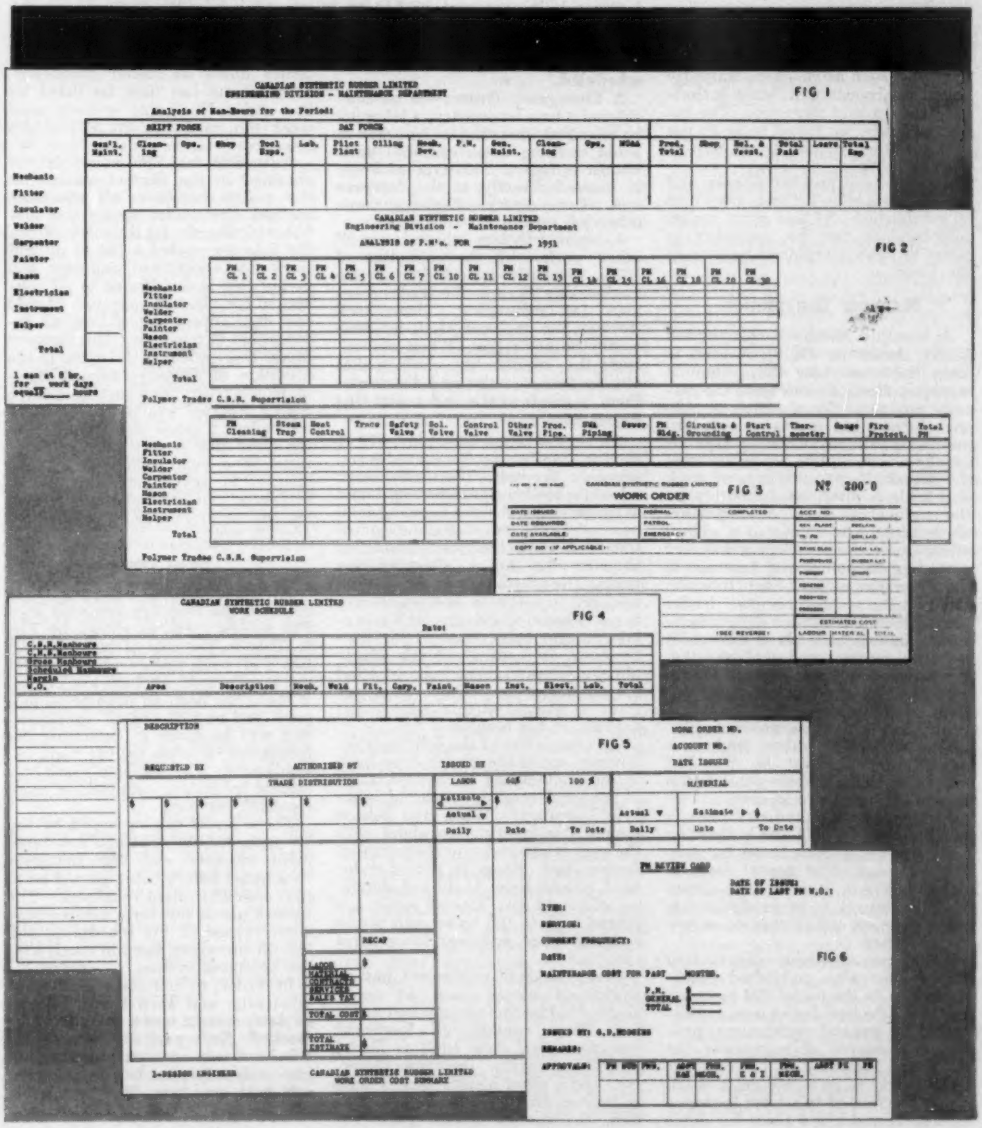
For the GM analysis, existing records were used to advantage. These figures, of course, had to be decreased greatly as the PM system eliminated a large percentage of this work. Included in this work is shift coverage, breakdown maintenance, routine maintenance such as packing, oiling, connecting tank cars, etc., and work involved in dismantling equipment, pipe, etc., for process reasons, while still in good physical condition. Again a man-hour requirement per class per trade is determined.

It is in the MC&A analysis that a firm policy must be established regarding what work shall be performed by the maintenance group and what is to be contracted, as this type of work is most likely to jeopardize a scheduled program.

Most maintenance foremen favor doing this type of work with their own crew for obvious reasons—it offers a break from routine work; they believe their own crew can do it better, cheaper, and in a manner that it will be easier to maintain; outside contractors paying construction rates can create personnel problems; and lastly, the more work he is given, the larger his crew becomes and hence, the more his job is worth.

Operating departments also generally prefer a plant crew to outside contractors on smaller jobs for reasons of liaison, safety, price, etc.

However valid many of these arguments, the number of men which can be justified on this type of work should be based on the normal continuous load, so that slack periods do



not produce excess shop time, and two over-ruling factors:

1—Is a larger crew needed for periodic shutdown schedules, which cannot be obtained elsewhere?

2. How available and dependable are outside trades in the locality?

When the policy is established, it is an easy matter to again arrive at a manhour requirement, per trade, per class, per year. By adding these sub-totals, the total trade requirements are determined in manhours per year. In order to convert this into men required, a net available manhour figure per man-year, is derived.

This figure is based on the gross manhours per man-year with deductions allowed for all non-productive time, such as vacation, statutory holidays, absence with leave including sickness, and shop time. The resulting figure we found to be 80 per cent of the year's gross normal working hours.

A theoretical number of men and their classification by trade may thus be established. At this point, minor compromises may be necessary in order to have a practical balance in the force.

Manhour Distribution

A Monthly Manhour Distribution Chart, shown by Fig. 1, is used to keep check on how the system is working. Basic figures from the calculations as outlined above, supply the distribution for any standard month of so many working days. A manhour distribution report showing the actual allocation of type of work and trade is distributed monthly by the engineering clerk. A comparison of these reports shows at a glance whether the force is being handled according to policy and just where the diversion exists. Each foreman can plot curves for his own trades as an added guide in his daily scheduling. In watching these curves, it must be remembered that vacation allowance has been spread evenly over the whole year on the basic chart whereas, in practice, the loss is mostly in the three summer months.

This should be taken into consideration in setting up the PM schedules, so that where possible the load is lighter in the summer.

A further manhour distribution is supplied for the PM work showing a breakdown of trade hours by class of equipment. The report form is shown in Fig. 2. It shows at a glance whether any class of equipment is being serviced out of season, or being neglected.

These two manhour distribution reports are also published semi-annually. As the initial PM program becomes effective, fewer men are required for general maintenance providing a source of manpower for additional PM work.

All work is initiated on a work order, the face of this form is shown by Fig. 3, and has a place for dates issued, required, and available, type of order, account number, area, general description, safety precautions, estimate and authorizations. The back of the form is ruled for labor and material estimate details.

Consideration is now being given to providing space for a brief reason to justify alterations type of orders.

Three types of work are handled on this form:

1. Patrol Orders—which are defined as work requiring not more than two manhours. This type of order is handed directly to the subforeman by the issuer. If the subforeman is in agreemnt, he has authority to do the work immediately. This type of work is handled by the shift mechanics, whose time is not scheduled.

2. Emergency Orders—to be considered a true emergency, a job must be required immediately in order to avoid shutting down essential units within 48 hours. This type of order is handed directly to the foreman and, if necessary, displaces some other job on the day's schedule.

3. Normal Orders—these cover all other work with the exception of PM's. The order is sent through the engineering clerk to the trades foreman for estimating. Then back through the engineer clerk for necessary authorization. When authorized, the engineering clerk makes out the trades copies and distributes them to the foremen and accounting department.

On receipt of a trades copy, Fig. 5, the foremen line up the material and schedule the job. The daily work schedule used is shown in Fig. 4, and is simply a ruled sheet showing total hours available per trade, and against this a list of the jobs scheduled showing the hours allocated per trade. The schedule is made out only one day in advance and manpower is not scheduled 100 per cent, a certain margin being allowed for contingency. In making out this schedule the foreman must keep in mind his allotment for MC&A work per trade as control at this point is left entirely in his hands.

On completion of the job, the subforeman sends the trades copy back to the engineering clerk with a list of material used or replaced, with brief comment. When the job is costed, this information along with the cost is entered on an equipment record card. Space is provided for total estimates by trade and detailing of actual cost. Costed copies are routed both to the issuer and to the assistant plant engineer for general observation.

Every piece of equipment has an equipment record card as noted above, filed by their equipment number. They contain all pertinent manufacturers' data such as Serial No., Drawing No., Purchase Order, etc., and a plant history record such as service, frequency of PM, inspection, changes in design, parts replaced either on PM or GMWO and total cost of labor and material for all work orders. At the foot of the card is a perpetual calendar. Colored plastic fingers indicate at a glance when work is scheduled.

A cross index file is also maintained with a card for each day in the year. When a schedule is set up for any piece of equipment, it not only is recorded on the history card, but is also noted on cards for each schedule date.

In this manner a clerk, working about a week ahead of the schedule, can pull a card out for any day and see all the items listed which are due on that date. In certain cases auxiliary cards are used such as where a whole line of equipment comes down at higher frequency. These items can then be listed by line and if No. 1 line is down next week this card lists the PM orders required.

Authority for PM orders is not obtained in the normal manner as the policy has over-all approval. Instead, the trades copies are distributed directly by the clerk. When the jobs are costed a list of all PM work by equipment number and giving cost is distributed to all concerned for blanket approval. Should any item appear out of line, all information is available. The foremen honor this system by bringing to the attention of those concerned items of excess cost. For instance, on a piping PM we would expect to be told when a large line is failing to the point that it may need replacement in a year. Then we have a chance to investigate the design problems. An understanding is soon reached as to what is acceptable and what is not.

Total Costs

At every second servicing, total costs on the item are recorded on a PM review form, as shown by Fig. 6. That is, the cost of both the last two PM work orders plus any GM work orders on an item are shown. If there has been no need to replace parts and no GM orders, consideration will be given to extending the frequency. If costs appear high, investigation will indicate need for change in design, material, or more frequent servicing.

These forms are reviewed by the foreman, his assistant and sub-foreman together and any pertinent data noted before being passed on to the assistant plant engineer. The correct use of this form insures constant review of the scheduling and lets all concerned keep in touch with the complete system.

In order to maintain equipment efficiently, and keep a schedule up to date, certain spare parts must be stocked. Each part should be identified not only as to part number but also with reference to all equipment which it may use. The reordering

(Continued on page 92)

By B. J. BEITMAN, Maintenance Analysis Division, The Goodyear Tire & Rubber Co., Akron, Ohio. Presented at the Plant Maintenance Conference, Cleveland

Training People for Maintenance Work

THE GOODYEAR training program has developed into a well-rounded training plan offering shop, supervisory, staff and scholastic training. Since 1925 this program has been supplemented by our apprentice training program.

Staff and supervisory trainees are carefully selected from a group of applicants between the ages of 21 and 28 years. They must be graduate engineers or journeymen.

Staff and supervisory trainees are assigned to "on-the-job" training during their first six months' service. This is an orientation period and by means of various maintenance and shop experiences the trainee can best learn his field, and through the training organization Goodyear can become acquainted with the trainee. The trainee must establish himself as a good promotional prospect during this period or be exited.

Trainees desiring to enter supervisional work continue training for 18 additional months. During this period they are assigned to various maintenance divisions and shops, are given selected staff assignments and are also used to fill in for supervisional absentees and vacations.

Trainees desiring to enter staff work are placed on a full program of staff assignments for six months and then transferred to a staff department on a permanent basis.

Courses at Goodyear University are an important function of staff and supervisional training. There are two hourly classes each week for trainees during their entire program. This course includes: Responsibility of Supervision; Tire and Tube Manufacturing; Business Speaking; Job Training; Industrial Relations; Mechanical and Miscellaneous Manufacturing.

Informative meetings are attended by managers of the various divisions of the company. Divisional functions, company policies, procedure and other pertinent problems are discussed to give the trainee a broad conception of our company and his place within it.

Trainees assume subjects for quarterly reports, thereby afford the training organization a method of evaluating the trainee's progress, comprehension and possibilties.

The Goodyear Apprentice Training Program meets all the requirements for training mechanics prescribed by the Ohio State Apprenticeship Council. It includes 8000 hr of shop training and 600 hr of classroom study. Those completing the training are given certificates by the Council certifying them as journeymen in their respective trades.

The course is open to high school graduates between 18 and 20 yr of age, who are mechanically minded and able to pass a rigid physical examination. Final selections of applicants are based on results of a competitive examination in scholastic subjects.

Four year courses are provided for machinists, electricians, pattern makers, blacksmiths, sheet metal workers, pipe fitters and power house engineers.

The course for machinists affords ample opportunity for experience on all machine shop equipment. It is distinctly different from one that would be designed to train men to operate single machines such as lathes or boring mills. A major part of engineering work at Goodyear is purely maintenance work, and to be a satisfactory mechanic, one must have a wide and accurate knowledge of Goodyear machinery and methods. Assignment in the Maintenance Departments is included since it is the only means of providing practical training in maintenance work. Bench and floor training is obtained through the assignment to our Machine Design Shop, where building and assembling complete special machinery is handled.

The course for electricians includes training in motor repair, construction and telephone work, general electrical repair and control work. The course is arranged to give the apprentice the experience required of a good electrician.

Miscellaneous assignments provide opportunities to extend the training in any branch of the trade found necessary. Thereafter he is allowed to specialize.

A pattern maker first learns shop practices and the reading of blueprints. He then learns the finishing processes and the significance of colors. He is assigned as a helper for a period and applies the majority of his hours on machine and bench work. Visits to machine shops and foundries are arranged to learn the reasons and the value of the product he produces. His final assignment is to assist, or observe work that presents intricate or unusual shop problems.

A blacksmith apprentice will be trained in the operation of all modern blacksmith shop equipment. Atomic, electric and acetylene welding are a part of his course. Heat treating is an important part of any modern shop. While it is expected that he will become a specialist in some particular field, he must be versatile.

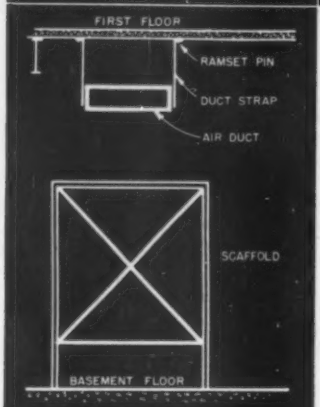
The course for sheet metal workers is designed to give an apprentice a balanced practice in all operations involved in sheet metal work and sheet pattern making. He has an opportunity to acquire skill and judgment in the use of machines and hand tools and to secure a working knowledge of sheet metal welding.

The course for pipe fitters is designed to give the apprentice a well-rounded knowledge of pipe fitting principles and skill in the use of the tools of his trade. This training gives him a thorough understanding of the intracacies of the plant piping system and automatic controls.

Power house apprentices are trained for the operation and maintenance of ash handling equipment, boilers, generators, pumps, compressors, deep wells, switchboards and other miscellaneous equipment.

Meter maintenance and compiling power plant records round out their course. This course is designed to prepare the apprentice to meet the requirements of a licensed engineer.

Studies for all apprentices include shop mathematics, algebra, trigonometry, physics, engineering drawing, mechanics, English, materials and shop theory.

THE JOB	THE COST			
	**Comparative Cost: Duct Strap Application**			
		OLD METHOD Acces-sible	Inacces-sible	**NEW METHOD** Accessibility Not a Factor
	1. Labor:			
	17 min at $2.575 per hr	$0.73		
	34 min at $2.575 per hr		$1.46	
	1 min at $2.575 per hr			$0.04
	2. Supplies:			
	Expansion Bolt	.25	.25	
	2 Flat Washers	.04	.04	
	Ramset Pin No. 2202			.14
	Powder Charge			.05
	3. Totals	$1.02	$1.75	$0.23
	Savings per fastening ($1.02 minus $0.23)			.79
	($1.75 minus $0.23)			1.52

Analysis of costs of installing air conditioning ducts in F. W. Woolworth building, Cleveland, by The Mannen & Roth Co.

TIME, COST ANALYSES OF

COSTS, not always being what they seem, are ideal subjects for dissection and close study by experts. The Trundle Engineering Co., Cleveland, composed of a group of expert analyzers, recently examined construction costs in connection with a study to determine the relative economies of drilling operations *versus* powder-actuated tool operation.

Two of the jobs on which studies were made consisted of a heating duct installation job in which steel straps had to be fastened to the ceiling to hold the duct work in place; and a bridle ring installation for holding communication wires on the ceiling.

The installation and subsequent study of the first above-mentioned job were made at the F. W. Woolworth Building in Cleveland, on a contract being performed by Mannen & Roth, contractors of that city. The latter study and installation of bridle rings were made at Weatherhead Company. The work on this job was done by Clark Electric Co.; both of these firms are also located in Cleveland.

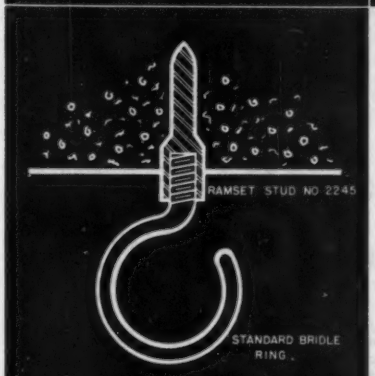
In order to establish a basis for sound comparison between the two methods it was necessary, on the duct strap installation, to establish time factors for drilling in concrete and steel, in "accessible" and also in "inaccessible" locations. The accessibility of the location was found not to be a factor in the powder-actuated tool operation so no allowance was made in the study of work done by this tool and the time consumed in doing the work.

Work elements required in the drilling operation for installation of steel duct strap in concrete floor slab were: 1. star drill hole in concrete floor slab; 2. insert expansion bolt; 3. punch bolt hole in strap; 4. bolt strap to concrete slab. The same operation, when it was necessary to drill a steel beam, was as follows: 1. drill hole through web of beam; 2. punch bolt hole in strap; 3. bolt strap to beam.

Work elements for the same operation but employing a powder-actuated tool were: 1. load tool; 2. hold

Photo: Ramset Fasteners, Inc.

Hanger straps holding heating ducts in this Indiana institutional building are fastened with threaded studs. T-bars running parallel with the ducts were also fastened with the same system. Bars will anchor a suspended ceiling.

THE JOB	THE COST		
	**Comparative Cost: Bridle Ring Application**	**Old Method**	**New Method**
	1. Labor Cost		
	9.02 min at $2.525 per hr	$0.379	
	1.03 min at $2.525 per hr		$0.0433
	2. Supplies		
	1 Lag Screw Bridle Ring	.12	
	1 Ramset Pin No. 2245		.16
	1 Powder Charge		.05
	1 Machine Screw Bridle Ring		.11
	3. Totals	$0.499	$0.3633
	Savings per Fastening ($0.499 minus $0.3633)		$0.1357

Analysis of costs of installing communication wire bridle rings at Weatherhead Company, Cleveland, by Clark Electric Co.

POWDER–ACTUATED TOOLS

strap and locate tool to work; 3. press shield to work and fire pin.

Equipment required on the drilling operation in concrete slab was: a pneumatic hammer, ¾ in. star drill, connection to power source, bench punch, and wrench. For drilling a steel beam: an electric drill, 7/16 in. twist drill, connection to power source, bench punch, and wrench. For powder-actuated tool work the only equipment required was the tool itself.

The cost data for both labor and materials used on duct strap installation, for one unit of work (one bolt or one fastener, by both methods, are shown in the table at the top of facing page.

Work elements required in the drilling operation for installation of the bridle ring in the concrete ceiling were: 1. star-drill hole in concrete ceiling; 2. insert and screw in bridle ring.

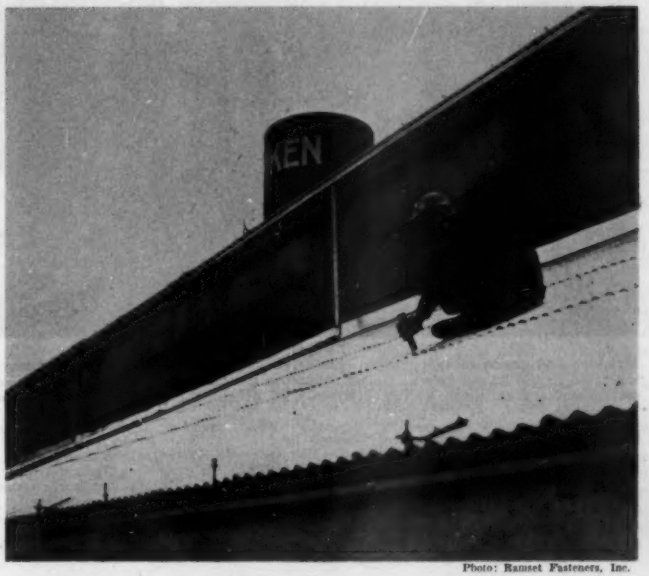
Work elements for the same operation, employing the powder-actuated tool were: 1. load the tool; 2. locate the tool to position and press shield.

Equipment required to install the bridle rings by drilling was: a hand hammer, a star drill, and a wrench. Here, again, the only equipment required for the powder-actuated tool operation was a powder-actuated tool.

The cost data for installation of bridle rings by both methods are presented in the table at top of this page.

On another job the installation of anchor pipe hangers for water, steam and condensate pipe took 30 to 40 minutes per fastener seated with the use of a star drill and hammer. A powder-actuated tool took exactly 40 seconds per fastener. Cost per fastener was cut from $2.53 in inaccessible locations and $1.89 in accessible locations to $.24 over-all. Cost reduction was 87.4 per cent and the work was done 45 to 60 times faster. Working conditions on this job were extremely favorable, however.

Fatigue factors considered by Trundle also point favorably to the use of the lightweight powder-actuated tool.



The operator is using a light-duty tool and fasteners to secure corrugated roofing to a Timken Roller Bearing building in Ohio. Use of a fixture on the end of the tool barrel allows for seating of the stud in pearling or in steel beams

Photo: Ramset Fasteners, Inc.

New Philadelphia Club Sets Fast Pace

Greater Philadelphia Plant Engineers Club, formally organized in December with twelve charter members, holds February meeting to consider means of advancing the professional status of the plant engineer

ON FEBRUARY 2, the Greater Philadelphia Plant Engineers' Club met at Philadelphia's famous Poor Richard Club for the regular monthly dinner meeting.

Richard H. Morris, Editor of Plant Engineering, spoke on "The Development of the Plant Engineer and His Place In Industry." Briefly outlined were the changes in industrial operation, organization and requirements as developed since World War I; the physical and management decentralization trends in the last two decades; and in more detail the World War II period with its exacting demands for good control and plant flexibility.

All of these factors played an important part in developing the need for the plant engineer and in placing him, unheralded and unsung, in the position of a key factor in modern industrial plant management organization. Other parts of the talk dealt with: typical organization; the influence of plant size; industry influence; geographical factors; and the influence of company history on individual plant organization.

This club, the latest in a constantly expanding group, was formally organized in the fall of 1950 with twelve charter members. It was, however, very firmly built upon a sound foundation of many preliminary organizational meetings. In March, 1950, four members, Godschall, McCaw, Clemens and Long, met for the first time. At the next meeting each of the four brought a new candidate: Budd, Redding, Stiner and Waligora. The group of eight agreed on four more possible members.

This round dozen, representing diversified industries and viewpoints, met several times to determine whether such a group activity would be worth while and later to formulate club policies before expanding further. The activity proved to be very much worthwhile and it was decided to organize formally and expand within definite limitations.

For the time being at least, membership will be limited to twenty men actively engaged in, and in responsible charge of, plant engineering work for their company. When practical, members will be selected from different industries to give diversified interest and veiwpoints and to avoid possible competitive situations. In general membership is limited to one in a company. By unanimous vote of the members two from a company can be admitted to membership if the company has two plants in the area.

Meetings to date have covered: departmental organization and control; budgets and budget procedures; and promotion of the plant engineer within and without the organization. Further scheduled meetings include: power, heat and light; project control and routine; labor relations and stream pollution.

Clubs of this kind are now operating in five cities: Boston, New York, San Francisco, Rochester (N. Y.) and Philadelphia. These are listed in the order of their founding. Nearly a score of other clubs are in the process of being formed in as many different cities across the country. If you are interested in this movement write to the Editor of PLANT ENGINEERING.

Stanlee Photo

Members and guests of the Greater Philadelphia Plant Engineers Club, February 2. Individuals are identified and officers indicated in the legend below. Unless otherwise indicated the address is Philadelphia. Charter members of the club are seated and are indicated by an asterisk. Two other charter members, Bert H. Levers and George K. Budd were not present

1. Robert R. Frederick*, Sloane-Blabon Corp.
2. James J. MacDonald*, (Board Member) General Electric Co.
3. John M. Waligora*, (Secretary) Sharp & Dohme, Inc.
4. C. E. Stiner*, Rohm & Haas Co., Bristol, Pa.
5. David J. Godschall*, (President) Heintz Mfg. Co.
6. Richard H. Morris, Editor, Plant Engineering, Chicago.
7. Donald P. West*, Simonds Abrasive Co.
8. James R. Clemens*, (Vice President) Link-Belt Co.
9. Daniel R. Long*, Crown Can Co.
10. Robert F. McCaw*, (Board Member) RCA-Victor Div., Camden, N. J.
11. W. Halbert Redding*, Rohm & Haas Co.
12. J. H. Odenheimer, General Electric Co.
13. William J. Slade, Crown Can Co.
14. Joseph L. Stone, Keebler-Weyl Baking Co.
15. E. P. Dean, ACF-Brill Motors Co.
16. E. J. Hagen, General Electric Co.
17. William H. Hibschman, Heintz Mfg. Co.
18. Warren F. Bower, SKF Industries, Plant No. 1.
19. M. Scerba, Hunter Wilson Distilling Co., Bristol, Pa.
20. James R. Flanagan, S. F. Whitman & Son.
21. Oscar Wilds, Plant Engineering, Abington, Pa.
22. T. M. Shea, Sharp & Dohme, Inc.

Tale of a Tramrail System and the Dividends It Paid

Helpers released to continue their jobs uninterrupted . . . System paid for itself in less than one year . . . Accident possibilities lowered . . . Fatigue almost eliminated while production is upped . . . All these benefits derived from one small tramrail system

Photo: The Cleveland Crane & Engineering Co.

Fig. 2. One man has been released to continue his duties elsewhere

AN EXCELLENT example of how even a small company can improve its production by modern handling methods is exemplified in the case of Modern Brass Foundry & Manufacturing Co.'s overhead system. This company recently installed a comparatively inexpensive, hand-propelled tramrail system which has more than doubled its productive capacity without any increase in manpower. Worker fatigue has been reduced and accident prevalence has been cut. The overhead system has paid for itself in considerably less than a year.

Modern Brass Foundry is a small jobbing company engaged in pouring all types of non-ferrous metals with the exception of magnesium.

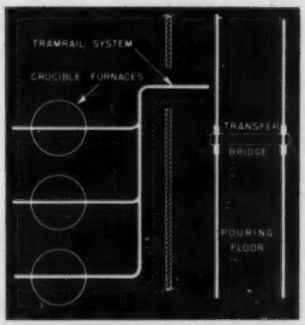


Fig. 1. Note how the furnaces are interlocked with the transfer bridge which covers the entire pouring floor

The castings are medium and light weight. There are three crucible furnaces installed; No. 70 crucibles, of 240 lb capacity are now used. Formerly 200 lb crucibles were used.

The tramrail system is so laid out that the transfer bridge extends over the entire pouring floor. It has an interlocking point by means of which the crucible-carrying trolley may be run over tracks to each of the furnaces. This makes possible fast and easy handling of molten metal without dangers involved in manual delivery.

Normally, there are ten workers in the foundry. One molder works on bronze to the exclusion of other metals. Four work on aluminum, while another works two days per week on bronze and the balance of the week on aluminum. In bronze work a molder averages two heats per day. With hand pouring it required the efforts of the molder and two helpers to carry the molten metal from the furnace room to the pouring floor. On reaching the molds another helper would be on hand to help hold the heavy weight. A fifth man would be waiting to keep the metal skimmed. With four men crowded around the pouring shank there was imminent danger of one of them tripping and spilling molten metal over all of them.

Since the tramrail system was installed the molder and one helper can push the filled crucible from the furnace room to the molds. One man is then required to operate the chain hoist, plus one other to do the skimming. This eliminates one man entirely and gives the molder and his one helper plenty of room to move about freely and safely.

With hand pouring a molder could pour two heats per day without being overworked. At times when the molder had heavy work to do he showed fatigue after pouring three heats. If the job called for more than three heats in one day it was necessary to have one of the aluminum molders pour the fourth and perhaps the fifth heat. This was decidedly unpopular with the aluminum molders because bronze is so much heavier than the aluminum.

With the help of the tramrail system a molder can now pour three heats per day without difficulty; in addition he can also put up two or three average bench molds per day. In rare cases, where the aluminum workers now have to lend a hand to the bronze workers they do not mind so much because the greatest part of the load is carried by the hoist.

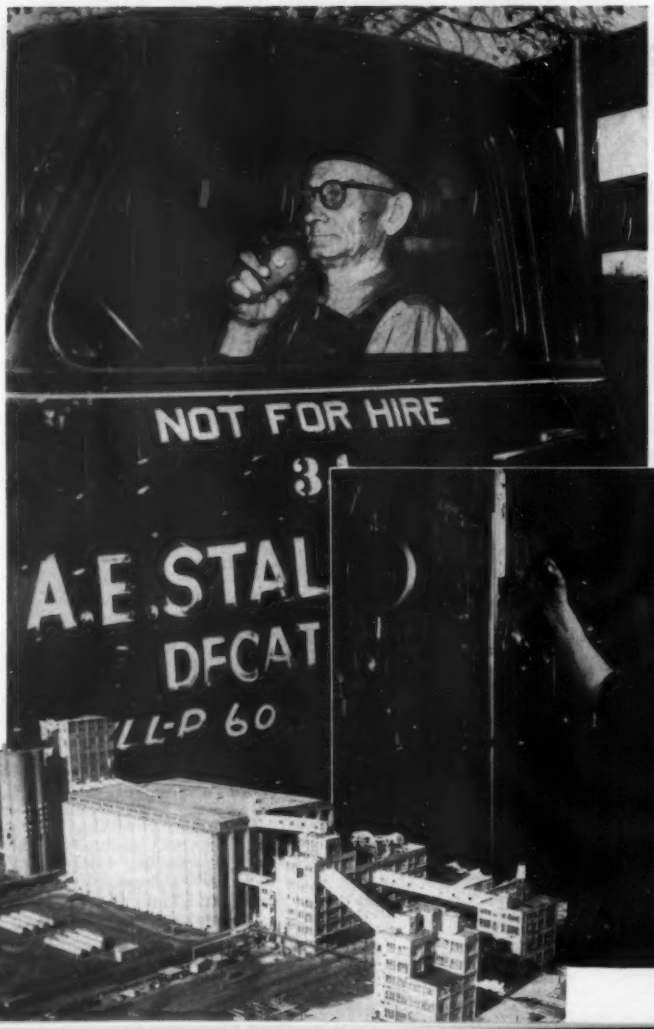
The core maker, one of the helpers in the shop, has never been called out of his room since installation of the tramrail. The other helpers are the furnace men, the grinder and the shakeout man; any one of these is usually available.

Recently, a large rush order was put through the shop. The smoothness and efficiency with which it was handled was proof positive of the value of the handling system. The job called for 600 bronze castings to be finished in so limited a period of

(Continued on page 94)

Two-Way Industrial Radio Pays Its Own Way in These Plants

Many examples attest to the effectiveness of two-way industrial radio . . . Production down-time has been cut drastically, maintenance forces are employed to the utmost of efficiency, accidents have even been avoided by use of this electronic tool . . . Two of the examples detailed here—Johnson & Johnson, and A. E. Staley Mfg. Co.—show how two-way radio communication can pay off in almost any plant



A. E. STALEY Manufacturing Co., Decatur, Ill., has employed its two-way radio for more than a year. Its value has been proved many times, but never more dramatically than in the "sprocket changing incident."

As the result of considerable study, and the pressing need for increased production, it was decided to install a larger sprocket on one of the processing units at the new soybean solvent extraction plant. The sprocket was made in Indianapolis

Left: George Hale, Staley truck driver, on way back from Indianapolis with new sprocket, contacts plant dispatcher as he enters radio range in vicinity of Decatur. Below: Dave Dryden, right, Machinist Foreman, takes Senior Mechanic Harry Augustine off his job for assignment at extraction plant to replace old sprocket when truck arrives

Photos: A. E. Staley Mfg. Co.

Right: Central dispatch headquarters at Johnson & Johnson contains, besides the man who keeps things going, a master short wave radio station with all trucks linked to it on same frequency; a plant layout chart in the background; stock record location cards (which the dispatcher is studying). The only identification required for each truck is driver's name; numbering is not necessary

Below: Driver of the electric truck has just deposited a load at the outbound shipping dock. He could have come from either the bulk reserve shipping area, or straight from receiving. Without dismounting from the truck, or even before the forks leave the pallet, he is calling the central dispatch headquarters for his next assignment

Photos: Automatic Transportation Company

and, in order to prevent any delay in its delivery, a Staley truck was sent to pick it up.

The actual changing of the sprocket was a simple matter, involving but a few minutes time. However, the particular unit involved had a capacity of 400 ton of soybeans per day; to shut this unit down prematurely would have meant the loss of highly valuable production time. It would also have meant that the maintenance man detailed to the job would have had to wait, after removing the old sprocket, until the new one arrived.

Staley's two-way radio came to the rescue. As soon as the truck came within its licensed operating range, the city limits, the driver contacted the dispatcher who, in turn, notified the maintenance department. The mechanic who was assigned to the job had just completed removal of the old sprocket when the truck arrived at the door of the extraction plant.

Production engineers estimated that 45 minutes production time had been saved, a not inconsiderable amount when stacked against the value of vegetable oils.

THE JOHNSON & JOHNSON shipping center at Metuchen, N. J. is another splendid example of good application of two-way radio. The J & J operation involves receipt of goods from its production plants, movement of them to reserve areas, to the order picking floors, or from either of these to the loading dock.

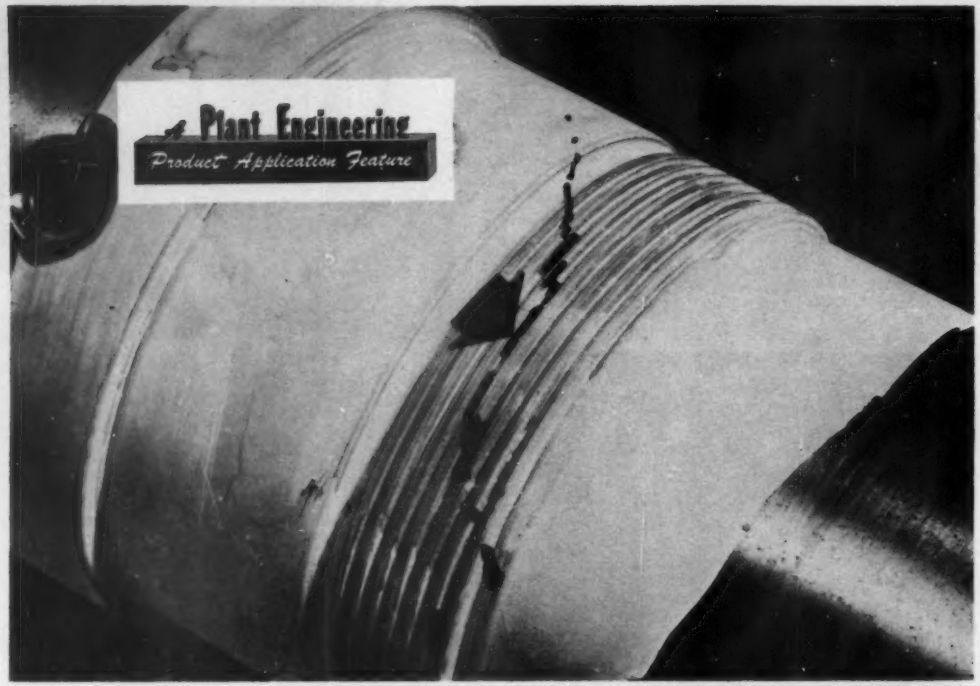
Here's how the operation was set up by Robert Bradley, Foreman, and William Conover, Industrial Engineer:

Two-way short wave radios were installed on each of the seven electric fork trucks. They are placed at the right of the driver's seat and are easily accessible. All sets, and the master set, are on the same frequency; thus, every driver can hear all orders and can better orient himself to the entire operation.

The master station, located in central dispatching headquarters, includes the voice and brains of the system, and several additional items. See above. The dispatcher knows where all merchandise is at any time and must keep up-to-the-minute on positions of his fleet.

Deadhead loads, idle time, waiting for pallet loads, and general confusion are eliminated. Another saving is in paperwork. In the past, assignments were worked out in advance, put on paper and handed to the driver who proceeded on his own from that point.

AT WEIRTON Steel's plant in Weirton, W. Va., the radio in a diesel switching cab was partially responsible for preventing possible loss of life and serious damage to property. One car, of a string that was being switched, broke loose and ran away. The engineer radioed the yard office to warn the ore dumper locomotive crew which was directly in the path of the runaway. The brakeman, in the meantime, was able to sprint a considerable distance to throw a switch and sidetrack the car onto a clear siding. Doubtless there have been many instances of the types reported on these pages. As more radio systems are installed their usefulness will grow because, everywhere, they are paying their own way.



The "hide-and-seek" properties of the chemicals used in a new dye penetrant inspection program have revealed a dangerous flaw in this crankshaft. Not visible to the naked eye, this flaw could have caused a costly failure if undetected.

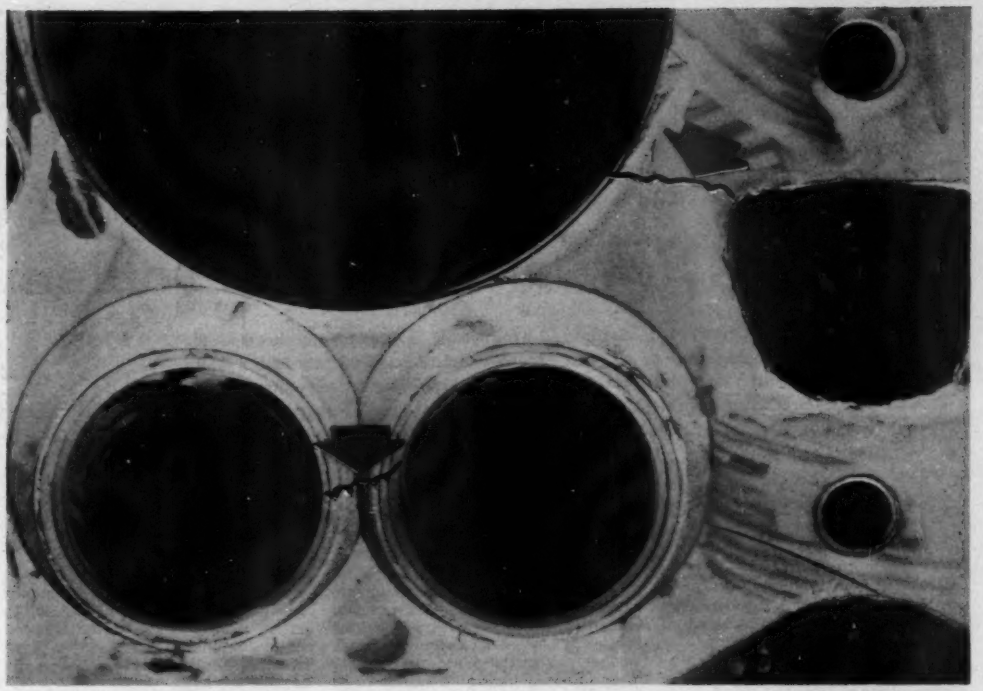
Cracked . . . ? Dye and See

BY INDUCING two chemicals to play "hide and seek" scientists at Northrop Aircraft, Inc., have developed an easy, simplified method for detecting flaws and cracks in precision metal parts. Described as a dye penetrant method of inspection, the process employs three easily-transported and easily-applied liquids: a red dye penetrant, a dye developer, and a dye remover.

The business of the trio of liquids as to detect flaws

Rapid, accurate maintenance inspection of carbide-tipped cutting tools is provided by the use of Dy-Chek. Machine shops that have installed this method of inspection as a routine procedure report reduction in hazards and losses.

Versatility is one of the chief advantages of this method. No elaborate equipment must be adjusted or set up for an operator to switch from one type of part to another. Many users find the spray method is best adapted to their needs.



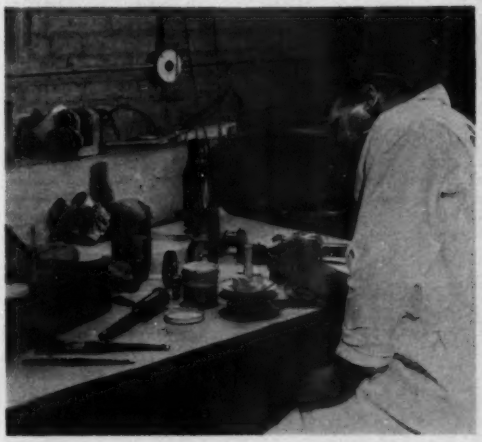
Engine and automotive repairmen find this method a rapid, inexpensive method of inspecting machined parts for cracks and separations. Two clearly defined cracks were found in this engine block when it was given the inspection routine.

in metal—flaws which are too small to be seen even under high magnification. Ordinarily, a liquid with high capillarity has high surface tension. The properties were reversed in this dye penetrant. It has high capillarity and low surface tension. As a result, the penetrant seeks out every surface flaw and tries to "hide."

In actual practice, the red dye is first applied to the metal part to be tested. It is allowed to penetrate for five minutes and then the remover is used to erase all visible traces of the dye. Lastly, the white developer is applied; it dries almost instantly. Wherever cracks or flaws are present in the metal surface, they are revealed clearly as crimson lines on a white background.

Readers of PLANT ENGINEERING who are interested in greater detail may obtain it by writing "Dy-Chek" on the no-postage required postcard, pages 19 and 117, and dropping it in the mailbox.

Plant maintenance departments find the method useful for proving the integrity of a multitude of small parts subjected to constant wear. Here, its application right at the work bench settles the question whether parts should be replaced.



Removal of the dye penetrant following the brief penetrating period is a simple process. The dye remover is first applied to the part. All visible traces of the dye can then be removed by wiping or by spraying with water as shown here

Planning a New Records Storage Center—Now a Current Problem

Why a records center? . . . Safeguard production . . . Reduce overhead costs with efficiency and safety . . . Cut record keeping costs 90 per cent . . . A separate center vs an integral center . . . Considerations in selecting a good location . . . Humidity requirements . . . Other hazards to be guarded against . . . Construction factors beyond fireproofing and floor loads . . . Storage boxes and shelving . . . Driveways, processing areas and microfilming needs

By **EMMETT J. LEAHY**, National Records Management Council, and **WESLEY A. CLARKE**, Atomic Energy Commission

THERE ARE TWO main reasons why plants and businesses have, in the past few years, found it imperative to provide special facilities for storing documentary evidence of their various activities. The problem of providing a suitable center is germane to both: (1) in the past two or three decades, the complexity of operating a plant or conducting a business has resulted in an unbelievable increase in the number of records or forms and their permanent retention in high cost office space is a prohibitive addition to overhead; (2) the advent of the air age, with the risk of aerial bombings, has made necessary special measures to protect records, especially in critical target areas.

One of the chief causes for the growth in records keeping is the multiplicity of mechanical devices with their ease of duplication. The typewriter alone increases many times the possibility of record duplication. Then again, the growing intrusion of Government into business, especially since the advent of the New Deal, has pushed record requirements to Gargantuan proportions.

What this can result in and how it can needlessly add to overhead costs can be illustrated by a few examples. A leading American manufacturer found that it had accumulated enough records to form a paper path that would circle the globe four times. A goodly proportion of them were obsolete. In planning a storage in a special records center, which is today saving the company $250,000 annually, this company destroyed 120 carloads of useless records.

Similarly one of the country's leading airlines while setting up a records center found it could destroy 72 per cent of them as useless. A steamship company threw away slightly over 40 per cent and a textile concern over 33 per cent. A properly organized records control program, including disposal and transfer of those not in current use to a low records storage center, can effect savings for almost any company.

This is proved by a survey, financed by the Rockefeller Foundation, and made by the NRMC[1] in 1949. It showed that approximately 35 per cent of all records kept by American business are unessential to company operation while an additional 30 per cent should be transferred to a low cost records storage center and reduce records keeping costs more than 90 per cent. Counting space and equipment each filing cabinet has been estimated to cost industry $40 annually.

Bombing and Production

In connection with the second reason for the growing need of records storage centers, to safeguard vital records against the new hazards of the air age, little discussion is needed to emphasize its importance. The Texas City disaster mentioned below is a case in point. In most plants, continuity of production is dependent on availability of vital drawings, specifications and other documents. A records center provides the means of supplying duplicates essential to early resumption of production should disaster strike part of a plant in which vital blueprints or specifications are kept.

The Texas City disaster in 1947 demonstrated this need in relation to resumption of production. That catastrophe was the nearest parallel in this country to the destructive force of an atom bomb or, what is almost as bad, saturation bombing by conventional bombs. Most of the damage at Texas City was from blast effects.

It took one company 70 man days to partially recover its records and 75 more man days to assemble them. Some of the vital records were never recovered. This particular company had its manufacturing facilities put completely out of commission. Disappearance of vital records was, therefore, not the factor that prevented resuming production for many months.

But, the 70 man days spent in recovering the records, the 75 more man days spent in assembling them and the complete loss of some records paints a dismal picture. It shows the time that would have been lost in resuming production had alternative manufacturing facilities been available. Compare this to the time required for a typically bombed-out plant in Britain to resume production, a plant where steps had been taken to safeguard vital records.

During the blitz of English manufacturing cities in November 1940, a munitions plant in Birmingham, England, had its roof completely blown off. A large part of its floor space and some of its machine tools were damaged. Undamaged tools and jobs were transferred to an-

[1] National Records Management Council was conceived in 1946 by the American Historical Society as a non-profit service organization for American business on problems affecting business records. It was started in 1947 by a $35,000 grant from the Rockefeller Foundation. The Council does consultant work, gives courses in Graduate Schools of Business, supports research fellowships, and conducts clinics for industry. Its executive director, Emmett J. Leahy, was a director of the Hoover Commission task force. The Council headquarters are located at 337 W. 27th Street, New York 1, N. Y.

other building and replacements were made of the damaged machinery.

The plant was in full production within 3 days because duplicates of every vital record needed to keep the plant in operation were immediately available. These had been kept in a safe records depository. This precaution was common practice and such quick resumption of production not unusual. American plants are just beginning to take similar precautions against the risk of a bombing war.

Primary Considerations

In planning and setting up a records center the aim should be economy, safety and service. The first influences the size of the building and this in turn depends on the flow schedule of records. Only essential records should be stored, and these only as long as they remain useful. What records should be kept and for how long is not an easy matter for the average business to decide. Nor is it within the scope of this article. It is, however, an important part of the impartial service which the National Records Management Councils[1] is set up to render.

Detailed physical characteristics of the ideal record storage center for both large and small companies will be discussed first. Later we will outline briefly the reasons why plants have, in the past few years, found it imperative to plan special storage facilities.

Now, keep in mind that the two main requisites are economizing on operational costs of keeping records and safeguarding the vital ones against destruction by unusual disaster. What general features are a "must" in a records center?

As a first step in economy, the records center must not be too ambitious in its construction. A large company may be justified in putting up a separate building. In this case, the records service center designed for General Electric at the Atomic Energy Plant at Hanford, by the National Records Management Council, may be taken as a model.

In the case of a small company, the records center may be a specially constructed and specially protected space in the plant building itself. The same main considerations will prevail, however, and some of these will now be discussed.

LOCATION. The center should be installed away from various hazards. It should be protected against flood dangers, whether from overflowing watercourses, heavy rainstorms, or defective service piping. The placing of the records center in the basement of a building is not recommended, nor is the building of a separate center in a spot vulnerable to flood damage.

The records center should be protected from fire hazards at all times. It should be remote from places where inflammable material is handled. While emphasizing the need for protection against fire hazard, the center should also be safeguarded against water hazards from sprinkler systems. The center itself should be fireproof so a sprinkler system is superfluous.

Even if it were not fireproof, a sprinkler system should not be operating in a records center as experience shows that water is more destructive to records than fire. This was the case in the Texas City disaster where primary damage was caused by water and not by the secondary fires that followed the blast.

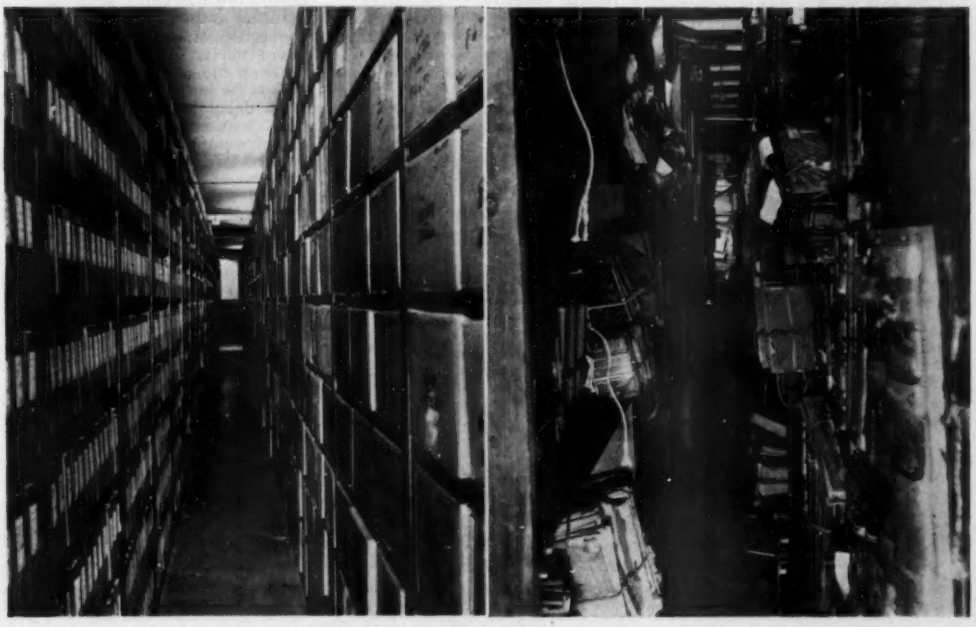
As a third precaution the center should be located away from hazardous conditions. In an existing building, it should never be located near the boiler room, where a boiler explosion would be likely to destroy the records. Similarly it should not be located where chemical fumes, injurious to pulp and paper, could deteriorate the records.

Air Conditioning?

While air conditioning with its added expense is not essential, the space should be reasonably dry. This is another reason why a basement location is not recommended. A relative humidity below 60 per

THE GOOD — **— THE BAD**

Steel shelving, cardboard cartons, plug-in telephone ducts, and floor to ceiling storage is desirable. In the photograph at the left, the aisle is 30 in. wide, the ceiling height, 11 ft 9 in. Pulpit ladders with brakes and two hand rails are best



cent is safe for records maintenance. This can be achieved by periodic checks and use of a chemical dehumidifier should humid conditions extend over a prolonged period of, say, more than a week.

CONSTRUCTION. The records center should be of fireproof construction with a minimum ceiling height so that records can be stored approximately 3 to 4 cu ft of records per square foot of floor space. The secret of the economical operation is the utilization of a minimum floor space for storage. Therefore advantage should be taken of vertical space to the maximum consistent with ease of access to the stored records for reference.

Records are fairly heavy material, approximately 30 lb per cu ft and they form a permanent deadweight where they are stored. The floor must be capable of supporting the maximum load calculated on the basis of the height of the record stacks.

Perils of the Atomic Age, however, inject considerations other than fireproofing and floor loads into the records center design. The ideal center should be blast proof as far as this is possible. This is not practical for distances of less than 3000 ft from ground zero of the blast. This dictates that no records center, in the form of a separate building, should be located within 3000 ft of an obvious target area. Even this precaution will not guarantee that the building would be safe from a hit by an inaccurately aimed bomb.

Use Reinforced Concrete

With the proviso that no building can be safe from a bomb dropped within 3000 ft, the Government publication, The Effects of Atomic Weapons[2] gives some valuable construction hints which will add to the safety of a building in an atomic blast. These factors apply to the construction of records centers in the Atomic Age. In the case of a records center installed inside another building, a 12 in. reinforced concrete wall, well tied to the structure, will give adequate protection against blast and radiation at distances greater than 0.5 mi from ground zero. The center should be built on the lower floors of a multi-storied building.

If a separate building is being considered for a records center, the strongest structures in an atomic blast are heavily framed steel and reinforced-concrete buildings. The design should allow for a horizontal wind component of 90 lb per sq ft with a vertical component of 70 lb per sq ft to provide protection against structural collapse at 0.5 mi from an atomic burst.

Cardboard Cartons Best

Storage of the records should be in cardboard boxes. These are more economical than steel or wooden files and quite capable of withstanding the wear and tear of infrequent reference to records in inactive storage. They should be placed on steel shelving of sufficient strength for the load to be carried.

Steel shelving is recommended rather than wood because, in the long run, it is more economical as it can be easily assembled, dismantled and re-assembled. The shelving should be arranged with sufficient space between the stacks for easy access to the records. To maintain the principle of economy, this aisle space should be kept to the ultimate minimum for utility. Wasted floor space has no place in a records center.

Provision for preferential protection of a small quantity of records, including such things as the company charter, minutes of directors' and stockholders' meetings, stockholders' lists and records of assets and liabilities, is usually desirable. This can be done by insulated safe-type equipment within the records center. Such special protection requirements normally need not be made for more than two or three per cent of the total contents of the center, just the most vital documents.

While the points discussed above are applicable to either a records center built as part of another building or a separate building, the latter permits certain refinements. These have been incorporated into the record center being built at Hanford for General Electric. The building, for example, will have a specially covered truck driveway where the records can be unloaded from a covered van without exposure to the elements.

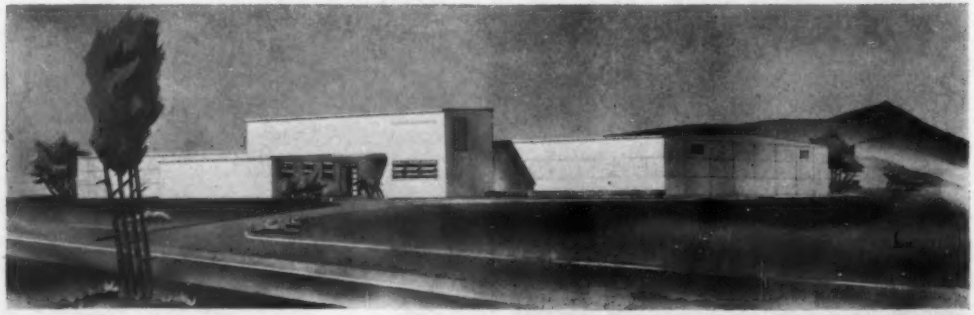
The driveway should be convenient to another very important element in the records center, the processing area. This is where the records are handled, screened and processed for storage. This is a major cost saving operation. It means separating the records to be destroyed from those to be kept. The latter must be inventoried. After being inventoried, the ones marked for storage are boxed and numbered. After a location register has been drawn up, the records leave the processing room for the shelving in the storage space. The others are flagged for destruction according to an approved schedule.

In addition to the processing room, the records center should have other important adjuncts. A room for microfilming has its proper, if limited, role in records keeping. In general, records must have a 10-15 yr retention period before microfilming is justified.

Miscellaneous Needs

There should also be a search room, for reference to records that need more continued study than is practical in the storage room. In this connection, it is desirable that telephone ducts, laid parallel with the shelving and with plug-in telephone outlets, be installed, to ensure minimum delay in the case of outside calls requesting reference to the stored records. The separate records center should also have an office to handle and house the necessary inventories equipment, and of course the usual amenities in the way of locker rooms and washrooms.

[2] Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., price $1.50. Same source Damage From At. Exp. & Des. of Protective Structures, price $0.10. See also: ATOMIC ATTACK, Council on Atomic Implications, Inc., University of So. California, Box 296, Los Angeles 7, Calif., price $1.00.



The ultimate in record storage centers now under construction for the Atomic Energy Plant at Hanford, Washington. A separate building is not always desirable for in many plants a center made as part of an existing building will serve better

SELECTION, USE AND CARE OF TOOLS

Drills—Speed, rate of feed, material being drilled and proper cutting oils are important

By THOMAS TRAIL, Maintenance Engineer

DRILLS ARE usually made of cylindrical steel, with two diametrically opposite spiral grooves, formed by milling or by forging and milling. The metal is given increased strength where forging and milling is carried out. The function of these grooves or flutes is to form cutting edges on the cone-shaped end, curl the resultant chips and provide channels for their escape, and allow lubricant to reach the cutting edges.

Figure 1 shows the principal parts of a drill point. For satisfactory results, the dead center must be in the exact center of the axis of the drill, and the cutting edges must be of equal length and equal angle. The narrow margin, being the full diameter of the drill, serves to accurately size the hole and reduce drilling friction. The diameter of a drill is generally made to decrease slightly from the point to the shank (the portion held by the drill press chuck), to help prevent its binding in the drilled hole.

Drills are made in four size classifications. Number drills range from No. 80 (.0135 in.) to No. 1 (.228 in.). Letter drills from A (.234 in.) to Z (.413 in.). Fractional drills 1/64 in. to 4 in. or larger by 64ths of an inch. Metric drills from 0.5 mm to 10 mm by 0.1 mm, and in larger sizes by 0.5 mm.

Drill shanks are made in straight, tapered (with driving tang on the end), blacksmith's, bit stock and ratchet patterns, as shown in Fig. 2. The most used types are tapered shank, for use in drill presses, lathes and metal working machines in general; and straight shank, employed usually in smaller drill presses and portable power drills.

For slow speed hand drilling and where first cost is an important factor, carbon steel drills, being lower in price, are used. But for power drilling, and drilling of tough metals, the high speed drill is preferred, though its cost is greater.

In using a drill, it is important, for long drill life and efficient metal removal, to select the correct drilling speed and rate of feed. These factors are, in turn, governed by the kind of material being drilled, the depth of hole, lubricant employed, etc. As a general rule, however, for drilling marble, slate and stone a drill speed of 15 to 25 fpm is recommended; for alloy steel 20 to 30 ft; stainless steel and hard chilled cast iron 30 to 40 ft; automotive steel forgings 40 to 50 ft; tool steel 50 to 60 ft; medium hard cast iron 70 to 100 ft; high tensile strength bronze 70 to 150 ft; malleable iron 80 to 90 ft; mild machinery steel 80 to 110 ft; soft cast iron 100 to 150 ft; ordinary brass, bronze, and aluminum and its alloys 200 to 300 ft; magnesium and its alloys 250 to 400 ft; and wood 300 to 400 ft.

Carbon steel drill speeds for such work should be limited to 40 to 50 per cent of these figures.

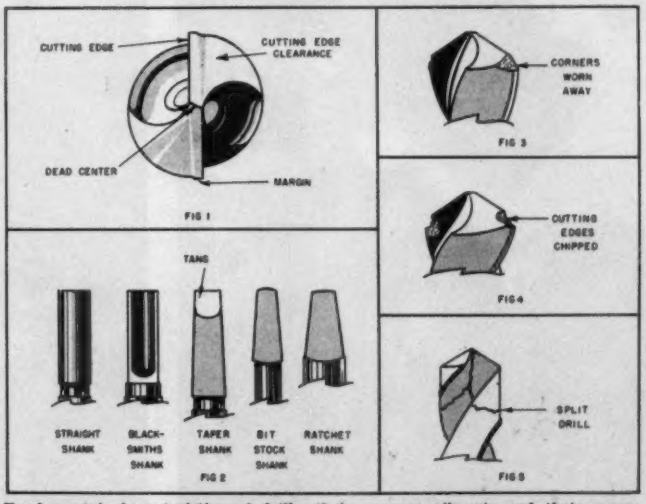
The number of drill revolutions per minute necessary to obtain these drill speeds is determined by the diameter or size of the drill. This information can be found for each size drill in mechanic's handbooks.

Drilling should be started with a moderate speed and rate of feed. After noting the condition of the drill, one or both of these may be increased or decreased. Unusual wear of the outer corners of the cutting edges, Fig. 3, indicates excessive speed. Chipping of the cutting edges, Fig. 4, indicates a too heavy feed or too much cutting edge clearance. Splitting of the drill, Fig. 5, indicates too heavy a feed for the cutting edge clearance, or insufficient cutting edge clearance at the drill center.

Drill diameter determines rate of feed. A general rule that can be used is as follows: Use a feed of .001 to .002 in. per revolution for drills smaller than ⅛ in.; .002 to .004 for drills ⅛ to ¼ in.; .004 to .007 for drills ¼ to ½ in.; .007 to .015 for drills ½ to 1 in.; and .015 to .025 for drills larger than 1 in.

No lubricant is necessary in drilling cast iron or brass, but for most other metals it is beneficial in cooling the drill cutting edges and the work, aiding in chip removal and improving work finish.

To minimize drill breakage and produce good work, have the work clamped securely and well supported, the drill centered and tight in the chuck, and employ the recommended speed and feed. In using taper shank drills, be sure both the shank and socket are smooth and grit-free, and that the drill tang is not bent or deformed. Drive the drill shank tight with a wood block. When removing a drill, place a wood block under the point to prevent it from being damaged by falling.



Fundamental characteristics of drills, their common ailments and their causes

AIR CYLINDERS WILL SOLVE

These examples, from the files of Compressed Air and Gas Institute, serve to show the versatility of compressed air cylinders applied to handling, production and movement problems often encountered . . . Perhaps these solutions may help headaches on some of your jobs . . . They have been employed as safety devices; they are doing work-holding operations; they function as jacks and powerful pushing tools . . . Materials handling can be performed with air cylinders

INDUSTRY HAS FOUND a countless number of ways to profitably apply air cylinders to production problems. Tool feeds, work positioning, material handling, application of pressure for various purposes and several other operations are frequently performed economically and effectively by employing air cylinders for the work.

There are many instances where plant engineers have worked out their own particular problems by adapting air cylinders to the operation and this article deals more with such applications than with the standard ones which are common practice in all manufacturing. By doing so, it is believed the reader may be given some practical suggestions applicable to his own plant problems.

All manufacturers are familiar with the principle of an air cylinder acting upon an oil cylinder not only to boost pressure, but also to keep it even from beginning to end of the stroke. Many types of tool feeds employ this principle to increase productivity of the machine and improve the quality of the work.

There also are many other standard applications of this principle, but it took the imagination of an automobile service department manager to apply the principle to the particularly difficult and costly job of pulling and inserting engine sleeve valves, Fig. 2, which are used on certain passenger cars and trucks.

The more-than-one-hour task was reduced to less than a 20-minute one by arranging a small air cylinder, operating at 40 psi, to act on a hydraulic cylinder to increase pressure at the tool to about 2000 psi. The pulling tool includes a hook which catches onto a bar below the valve sleeve and an expanding collar, which pushes against the sleeve.

Fig. 1. An air cylinder actuates the jaws of this device used for crimping terminals on the ends of wires. The positive, uniform pressure facilitates work, improves the product

Fig. 2. In unit at right, air cylinder at bottom increases pressure in hydraulic cylinder at top. Tool in mechanic's hands slides the sleeve out or in by means of collar and piston

MANY PROBLEMS

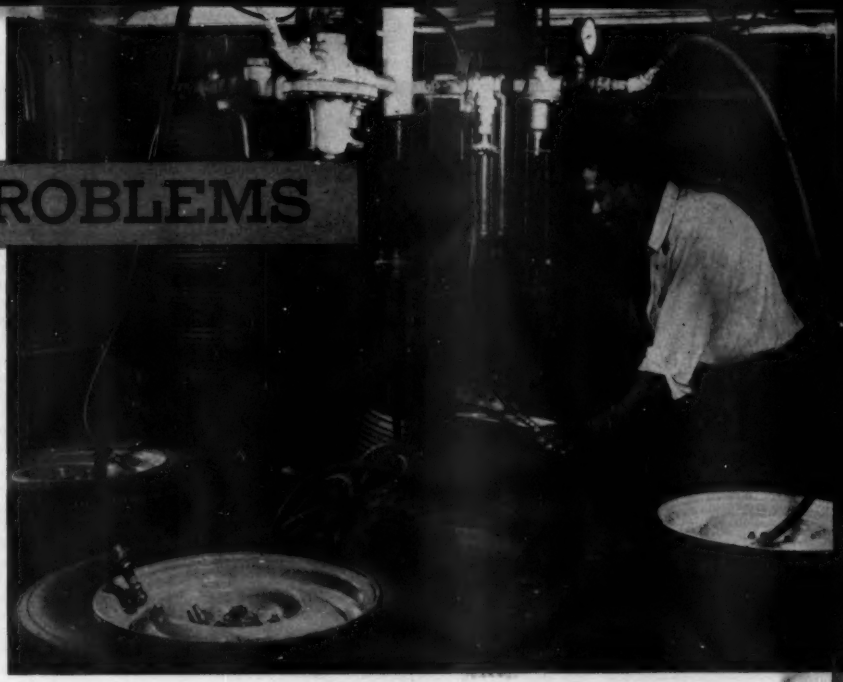


Fig. 3. This tire mounting machine is believed to be the first used in the automobile industry and is still in use. Air cylinder pushes tire while wheel turns. Air hose is then attached for pressure-regulated inflation and by the time the wheel completes a turn it is ready for assembly

The high and even pressure of the tool easily slides out the sleeve and in reverse, slides in the replacement.

The same principle is applicable to dozens of other difficult fitting operations with proper variations of the tool to the conditions. Where such high pressures are not required, air cylinders alone can accomplish similar work, such as assembling bushings.

Pipe mills, boiler shops and other plants working with heavy plate to be rolled depend upon carriages, which are raised and lowered by air cylinders, for much of their material handling along the production line. For example, the carriage may be used to transfer the work from one line to another, or raised to position the rolled plate for welding. This is a common application for air cylinders in the field mentioned, but it may suggest an adaptation of the idea in other industries where the practice is not so common.

One plant taken for example covers a large area and makes a large number of the heavy parts which go into its finished products. The plant is versatile in its operations in that it makes several products, so there is not an exact pattern of work flow in the several different production departments.

Girded by Rails

The company, however, avoids the delays of waiting for factory trucks to move castings and other heavy parts within the department and from one department to another by having a rail system that girds the entire plant. When the load is to be transferred but a short distance, it is placed in small cars and pushed to its next station by the workers. Movement in any direction is possible because of the lift tables at track inter-sections. A piston actuated by an air cylinder raises the table. A ball bearing race on top of the piston makes it easy for the workers to swing the car around so it can be lowered on the intersecting track.

An automobile manufacturer has another kind of application for air cylinders which is believed to be the fastest way known to inflate tires, (Fig. 3). The apparatus consists of a four-way valve, a bleeder valve for measuring air into the air cylinder with a shaft at both ends, and a pilot control. The tire mounter operates this control with his foot. The bleeder valve then opens a measured amount of air so the tire may be inflated at full line pressure from the exhaust side. The shaft at both end equalizes the volume of stroke.

Inflating Speeded

This method replaced the conventional one which employs a balanced orifice, that becomes smaller as the tire is inflated, which not only slows down inflation time, but also tends to under-inflate because of tube resistance. Uniform tire pressure is especially important when shipping new cars in order to avoid the damaging bouncing which otherwise would take place in boxcars. There are, of course, many other manufacturing operations than inflating tires where uniform air pressure is desired and where the principle described could be applied.

One example is found in the plant of an oil well equipment manufacturer. Pipe of extremely tough steel is used for making liner shells. Kinks are found in some of the pipe, which normally would mean ordering thicker material to allow for extra machining to remove the kinks. The manufacturer has saved that double expense by rigging up a press with parallel bars for the pipe. As the pipe is turned, the operator chalks the high sides from a hand rest. Then, a piston actuated by an air cylinder is brought to bear on the high sides to bring them into line, as shown by Fig. 4.

Easy Regulation

The entire apparatus was worked out in the plant. An air cylinder was used because the pressure could be easily regulated according to the amount needed for varying conditions by the simple regulation of a screw. The cost of building and operating the device was small, but the savings in machine time and pipe cost are very large.

Work ejection from presses and other machines can frequently be handled most efficiently with the aid of air cylinders. A large aluminum fabricating plant uses such a method, shown by Fig. 5, on a combination punch and trimmer. The air cylinder is below the dies. On completion of each operation, the air valve is tripped so the piston will rise to kick out the piece. The plant found this method far more simple, dependable and economical than a mechanical ejector would be.

A variety of uses for air cylinders

Fig. 4. Liner shell material is straightened in this manner. The stroke of the air piston is regulated by the operator to a fine degree by turning the screw

have been cited, but obviously it would take many books to suggest all the ways this important aid to industry can be used. Manufacturers frequently equip milling machines or drills with air cylinders so that one operator may tend five or six machines instead of just one, because he can easily move from one machine to another to load or unload the work and move on.

Versatility the Key

Light manufacturing operations and assembly departments apply air cylinders to work formerly done by foot pedal or hand. In some cases, work formerly positioned under a press by hand is now handled by air cylinders as a safety measure. Upending of heavy drums, tilting and other backbreaking jobs have been eliminated by various applications of air cylinders to the work. But rather than attempt a cataloging of their uses, it might be better to consider some of the characteristics of air cylinders as a guide to application under different conditions.

The air cylinder in itself simply applies a push or a pull as the case may be. The benefits to be gained from this fact depend entirely upon the way this action is applied. Production men with imagination and ingenuity have discovered those benefits can be very significant.

Cylinders vary in size according to requirements, both as to power of stroke and length of stroke. They are of simple, durable construction and as a result deliver dependable performance with very little attention, even under adverse conditions. Air cylinders are sometimes used, for example, to raise and lower oven or heat treat doors and around fumes and chemicals which would tend to destroy mechanical apparatus.

Because of their air operation, the cylinders are powerful and elastic in action. For example, on the many different clamping applications, there is no need for special adjustment on material of varying thickness. The action furthermore, is positive and easy to put into operation. Production lines of various kinds frequently use air cylinders as a safety block simply by having the moving assembly trip an air valve and release a piston to hold the work from moving along the line under certain conditions when it is either dangerous or inadvisable.

Save Labor; Money Too

These characteristics explain why air cylinders are so easily applied to so many different operations and can be depended upon to perform their assigned task.

Those who will keep the characteristics and application possibilities of air cylinders in mind will find they frequently can serve in place of more costly mechanical devices in many operations and also can replace many tedious and slow manual operations with a resultant savings in time and worker fatigue. Practically all modern factories are equipped with a compressed air system, so there is no obstacle to putting air cylinders to work wherever the opportunity arises for effecting manufacturing economies.

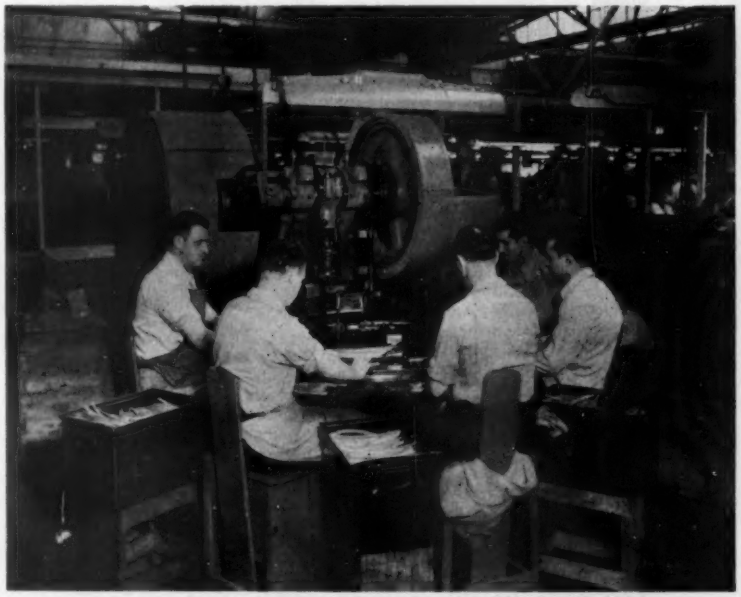


Fig. 5. Dial-type press from which finished parts are ejected by compressed air. The air cylinders are out of sight below dies and are operated by the workmen

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Quiet, efficient Trane Fans are expressly designed for unit heater requirements. Broad, all-steel blades push large quantities of air over the entire heating surface. Built-in draft diverter, one-piece cast iron burners and automatic safety controls. AGA and Underwriters' Laboratories approved. Seven models between 50,000 and 210,000 BTU input.

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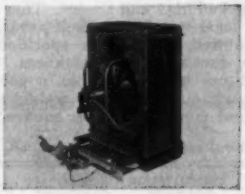
Typical installation where Trane Gas Unit Heaters provide plenty of warmed air for spot heating requirements.

Burner assembly slips out like a drawer—saves time, simplifies maintenance.



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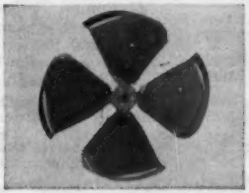
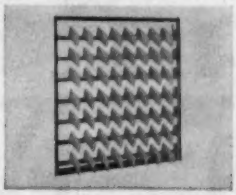


The famous Trane Louver Fin Diffuser. Finger-tip air stream control both vertically and horizontally.



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Concerning Ducts
and How to Utilize Them For Economy and Service

By ROBERT H. EMERICK, Consulting Mechanical Engineer

IN SOLVING duct problems, there seems to be a plan suited to every temperament and every purse. There is, for instance, what we might call the Meticulous Ship Method. In following this method engineers measure and calculate, and then prepare detailed shop fabrication drawings for every foot of proposed system.

Those of us who find the meticulous approach unappealing, might consider the Simplified Practice Recommendation[1] issued by the National Bureau of Standards. This simplified practice was developed by the Bureau in collaboration with manufacturers and distributors of duct work, for warm air heating, air conditioning and forced air circulation with the objective of providing reasonably priced prefabricated ducts, pipes and fittings. To use prefabricated duct requires some flexibility in design and in some cases strict adherence to calculated dimensions.

In selecting material for ducts, one may choose from galvanized sheets, aluminum, copper, asbestos, masonry materials, almost anything in fact that has some structural strength and that will hold air. Glass and plastic materials already are available in piping and sooner or later may be offered for duct fabrication. No doubt they will have some advantages.

Aluminum is good looking, and unless there is some local requirement, need not be painted. In alloys recommended for duct work, it is readily worked and may be given various lock seams without difficulty. In the harder and more brittle alloys, as used for aircraft construction, it is not suitable for ducts and should not be used. Surplus stock to be used for this purpose, should be bought with caution.

Aluminum fabrication should not employ dissimilar metals for rivets or duct supports, and aluminum should be protected from such contact. At best, unsightly rust stains may appear if this point is overlooked. At worst, galvanic action of the dissimilar metals may destroy the duct prematurely.

In comparing the weight and thickness of aluminum and galvanized sheets it is necessary to deal with two different standards. Aluminum sheets are rolled to the American or Brown & Sharpe gages while galvanizing is accomplished by zinc coating black iron or steel which has been sized originally to the United States or Manufacturers Standard. This means that galvanized sheet is thicker than the black core. This additional thickness is in itself a variable, as the zinc coating is specified by weight instead of thickness. Generally, to be acceptable, a galvanized sheet must bear by weight at least 1¼ ounces of zinc per square foot, on each side.

[1]A copy of the simplified practice recommendations for pipes, ducts and fittings in warm air and air conditioning service, and containing sizes, shapes and dimensions, may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for 10¢.

Table 1. Sheet thicknesses for ducts

GALVANIZED[1]		ALUMINUM[2]	
Mfrs Std Gage	Thickness, Inches	B & S Gage	Thickness Inches
18	0.0478	13	0.07196
		16	0.05082
20	0.0359	16	0.05082
		19	0.03589
22	0.0299	17	0.04526
		20	0.03196
24	0.0239	19	0.03589
		22	0.02535
26	0.0179	22	0.02535
		25	0.01790
28	0.0149	24	0.02010
		26	0.01594
30	0.0120	25	0.01790
		28	0.01264
32	0.0097	27	0.01420
		30	0.01003
34	0.0082	28	0.01264
		31	0.00893

[1]Mfrs Std Gage values for galvanized sheet are gage values of the black core under the zinc coating. [2]In each case, a range is given for equivalent aluminum gages. Judgment of conditions to be met should govern the choice of gage.

Table II. Sound absorbing materials, as commercial, pre-fabricated and plastic

MATERIAL Sample No.	Fire[1] Code	THICKNESS Inches	WEIGHT Lb/Sq Ft	COEF. OF ABSORBTION[2] 128	512	2048
1	B	1	2.60	0.19	0.95	0.78
2	C	1¼	1.58	0.17	0.97	0.50
3	A	1¼	2.58	0.15	0.93	0.74
4	A	15/16	1.54	0.20	0.92	0.84
Tile	A	4	19.50	0.32	0.90	0.79
Plasters[3]	—	½ - ¾	—	0.13-0.60	0.30-0.90	0.36-0.70

[1]Under the heading of Fire Code, symbols mean: A is incombustible; B is fire retardant; and C is combustible. [2]Coefficients of Absorbtion are given for three frequencies: 128, 512, and 2048 cycles per second. [3]Plasters may be sprayed or trowled depending on type.

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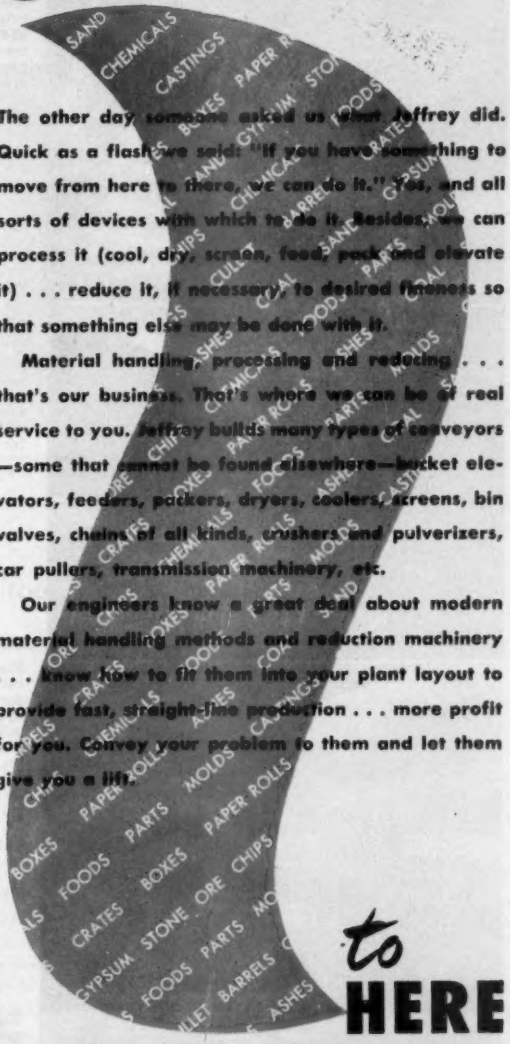

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Fig. 1. A large installation of aluminum duct work. Note the bright surfaces and kinking or creasing used as reinforcement to prevent breathing of large flat areas

Fig. 2. Branch connection details in aluminum duct work. Alloys recommended for duct work are readily worked and are adaptable to locked seams

Fig. 3. Prefabricated asbestos duct installed on the ceiling of a public utility control room. Asbestos 0.5 inch thick is comparable in weight to 20 ga. galvanized sheets

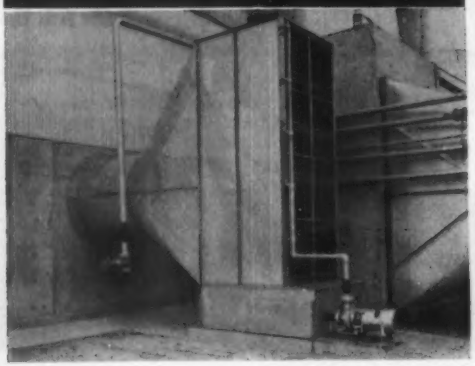


Fig. 4. Aluminum spray washer housing and duct work installed outside in a damp southern coastal area

PHOTO CREDIT
Figs. 1 and 2, Reynolds Metals Co.; Fig. 3, The Philip Carey Mfg. Co.; Fig. 4, The Aluminum Co. of Amer.

To simplify comparisons of aluminum and galvanized sheets, Table I has been computed by the Reynolds Metals Co.

Preformed asbestos is another alternative in the choice of duct materials. Asbestos duct[2] will neither rust nor decay, it is not susceptible to vibration or breathing, it does not conduct electricity. In standard thickness of 0.5 inch, the duct weight is approximately 2 lb per sq ft, or slightly heavier than galvanized sheets of an original No. 20 gage. Standard thickness of 1 in. is available "off the shelf." In all weights, sections generally are supplied in 3 ft lengths.

Copper ducts are not commonly used in plants for several reasons, not the least of which is the cost. In the experience of this writer with copper, mostly aboard ship, trouble occasionally developed from vibration, the copper becoming fatigued after which it split. While annealing is a direct specific for fatigue, the practice involves some time and inconvenience.

Regardless of materials, the installation of a duct involves a multitude of other problems. For instance, shall our duct be rectangular square or round?

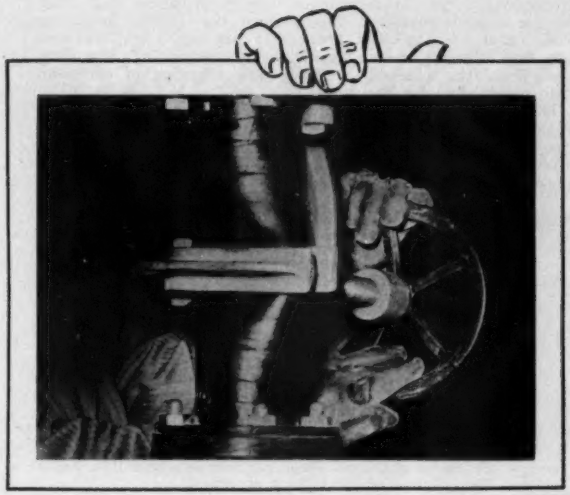
A round duct is the ideal from the standpoint of carrying capacity at equivalent friction loss, a square duct next, the flat and narrow body of common practice last. Nevertheless, the rectangular duct is commonly preferred. It looks better than either of the others, it can be faired into the surroundings with more success, and we can lead branches from it like turning pages in a book.

What velocity[3] shall we choose? If noise is a matter of concern, we might do well to set a limit of 1,000 to 1200 ft per min, in the main ducts. Branches should step down to 800 to 1,000 ft per min; on branch risers the same. However if the duct is traversing a shop in which running machinery is present, these velocities may be increased substantially, for then a little noise is of no more importance.

How and where should ducts be sectionalized? Many of us install ducts without any sectionalizing whatever, and nothing ever happens. On the other hand, an automatic fire stop damper is a highly desirable adjunct in duct systems that serve complex processes and wide areas. There is nothing more disconcerting than to have an unexpected rush of flame begin breathing down one's neck. These fire stop dampers generally are actuated by temperature, a sudden or other-

[2]See Correct Air Distribution is Important in Air Conditioning Systems by F. Honerkamp, page 52, April 1950 issue.

[3]See Making Air Duct Calculations Easy by Thomas M. Jackson, page 40, October 1948 issue.



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The Neoprene Notebook

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NEOPRENE

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wise abnormal rise closing the damper. Hand operated dampers are convenient for segregating departments and for checking occasional fumes.

Once in place, ducts rarely give serious trouble in themselves. Nevertheless at times they require treatment for conditions that develop after erection, such as sweating, or the transmission of undesirable noise.

Sweat problems are solved quite simply by either the application of insulation, or by raising the temperature of the air in the duct above the ambient dewpoint. The choice rests on decisions of cost and the necessity for maintaining sub-dew point temperatures in the duct. If low temperature is not essential, heating the air with a steam or hot water coil is likely to be cheaper than insulating long ducts.

Noise correction is not always simple and it may be necessary to try several treatments. For instance, while vibration can be stopped effectively with flexible non-metallic joints in the duct run, noises have been known to travel through the system as clearly as words over a voice tube.

If the noises cannot be stopped at the source then the first prescription is likely to be sound absorbent lining introduced into the duct. Here again, there are a multiplicity of choices the National Bureau of Standards having compiled data on more than fifty commercially available materials. In deciding which of these to use, it is best to be governed first, by the desire to install something non-combustible, and second, something that does not impose excessive friction on the air stream.

Allow 10 Diameters

Next, this material should be installed on all inner surfaces of the duct for a distance of at least 10 times the average duct dimension if the duct is rectangular, and ten times the diameter if either square or round. As these materials will average 1 to 1.5 in. in thickness, we must expect an increase in velocity and friction through the insulated area.

Table II presents some data from a half dozen materials which the Bureau of Standards terms Class A. This means the material will absorb 90 per cent or more of the sounds vibrating at the test rate of 512 cycles per second. The weight of the material, in some cases, exceeds the weight of the duct. This, too, is something to consider.

An alternate treatment is to form boards or plates of the sound absorbing material into a honeycomb or egg crate, and set this honeycomb in the air stream. The air passes through the galleries of the honeycomb, and, theoretically, the noise is absorbed by the multiple surfaces of the material. Of course the obstruction to air flow is considerable so that the duct should be widened at that point to compensate for the obstruction. The total free surface of the honeycomb should equal the free area of the duct.

Sometimes mysterious duct noises arise from objects left in the duct during construction. Old shoes, gloves, pieces of wood and such things have been found bouncing around to set up vibrations and rumbles, suggestive of gremlins, actually the offspring of carelessness.

In the approach to any duct problem, no matter how complex it may appear, if we remember that common sense is the soul of engineering, the solution will be simplified.

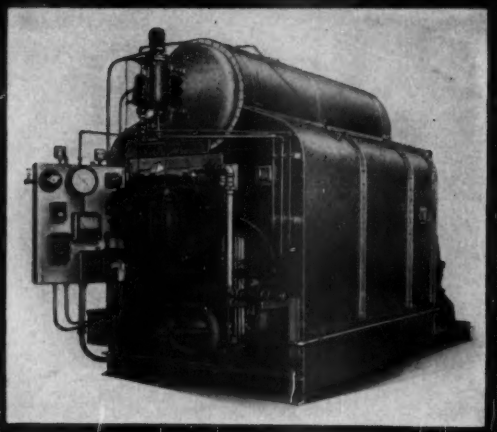
Table III. Designer's chart for use in selecting materials and velocities. It is useful for such things as planning, layout, maintenance and trouble shooting work

PROBLEM FOR CONSIDERATION	RECOMMENDATION OR SUGGESTED APPROACH
VELOCITY (Quiet areas)	(a) Outside air intakes, 800 to 1,000 ft per min. (b) Main ducts, 1,000 to 1,200 ft per min. (c) Branch ducts, 600 to 1,000 ft per min.
VELOCITY (Noisier areas)	(a) Outside air intakes, 1,000 ft per min. (b) Main ducts 1200 to 1500 ft per min. (c) Branch ducts, 800 to 1,000 ft per min.
COMPRESSOR INTAKES	(a) If a battery of compressors is using large volumes of air, the construction of a roomy plenum chamber is desirable. The operation of the compressor valves sets up velocity waves similar to water hammer in a pipe line, and a large plenum acts as a shock absorbant. (b) Use individual silencers.
SPEAKING TUBE EFFECT	(a) Introduce sound absorbing material against inside surface of duct and carry for at least ten times the average diameter or dimension. (b) Install a sound absorbing honeycomb in the duct, with free areas equal to free area of duct.
VIBRATION	(a) Use canvas, rubber or foil joints wherever ducts join apparatus. (b) Insulate the machinery foundation with cork, rubber, or a commercial type vibration dampener. (c) Wooden floors sometimes tend to act as sounding boards if the spans are large. Reinforce the floor, or carry the machinery on masonry foundations supported from the ground. (d) Stiffen ducts, particularly large flat compressors.
DIESEL ENGINE INTAKES	(a) Same treatment as for compressors.
SWEATING	(a) Insulate surface of duct. (b) Raise temperature of air or gas in duct to a value above the ambient dew-point.
FOREIGN INVADERS	(a) Use insect screens against bugs, birds, etc.
MATERIALS	(a) Galvanized sheets are the long established standard. (b) Aluminum can provide a beautiful job, but ambient conditions should be carefully weighed. Must not be riveted or supported by dissimilar metals to avoid galvanic action. (c) Copper fatigues and becomes brittle from vibration. If used under these conditions, may require annealing from time to time. Is attacked by ammonia in the presence of water, so should not be chosen if ammonia is present in the atmosphere. (d) Preformed asbestos provides its own sound absorbing capacity, does not corrode. Is slightly heavier in a 0.5 in. thickness than is 20 gage galvanized. (e) Masonry and wood tend to create high friction losses and can not be installed for physical reasons in some situations. Wood also constitutes a fire hazard.
DAMPERS	(a) Automatic dampers for fire and fume-stops should be installed in long runs leading from department to department. (b) Hand dampers should be set in each branch for balancing flow in the system and to prevent short-circuiting.
CHANGE OF DIRECTION or CHANGE OF SIZE	(a) Use long sweep tranformations wherever possible to avoid eddies, turbulence and high friction losses. (b) Use turning vanes when change of direction is sharp, or corners are square.
GENERAL RULES OF CAUTION	(a) Follow latest A.S.H.V.E. procedures. Usually available in the current issue of the Guide.[1]
MAINTENANCE NOTES	(a) Troubles with existing ducts may be the result of conditions set down in this chart. In these cases, the suggested approach may also suggest the cure.

[1]The Heating, Ventilating and Air Conditioning Guide is published by The American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York 10, N. Y. Price $7.50.

Here's What You Get...

for your [redacted] *dollar*



Compact Design—The Keystone packs large steam capacity in small cubage, because of its unique furnace, contained within a low-head 2-drum water tube boiler.

Conservatively Rated—The Keystone offers unusually large heating surface per developed horsepower. Ratings are based on 5 square feet per developed horsepower—accepted practice in water tube boiler design.

Fast Steamer—The Keystone is highly responsive to changing load demands, for hot gases travel 3 lengths of the furnace, contacting 5 bare metal heat absorbing zones. Big boiler performance in small space.

Centralized Control—All specified instruments and controls, factory assembled, and mounted on a central instrument panel. All electrical connections to terminal blocks eliminate inter-connecting field wiring.

Automatic Burner—The Keystone is equipped with fully automatic burner for gas, oil or for both interchangeably.

Insulated Steel Casing accurately fitted to reduce radiation losses and air infiltration—removable panel type—all tubes accessible.

Combustion Control—interlocked electrical controls, steam pressure actuated for smooth adjustment of fuel, primary and secondary air supply to obtain most efficient high and low flame position.

Induced Draft equipment is of low speed, conoidal type with automatic damper control on panel.

Safety Controls include automatic cut-offs for high pressure, low water, flame failure, induced draft failure and fire switch.

Easy to install—easy to maintain—Keystone requires no special foundation or stack—just set in place and hook up service connections. Wind box is hinged for easy furnace inspection, hinged burner swings out for inspection—removable side panels give access to any tubes—manholes provide access to drums and tubes.

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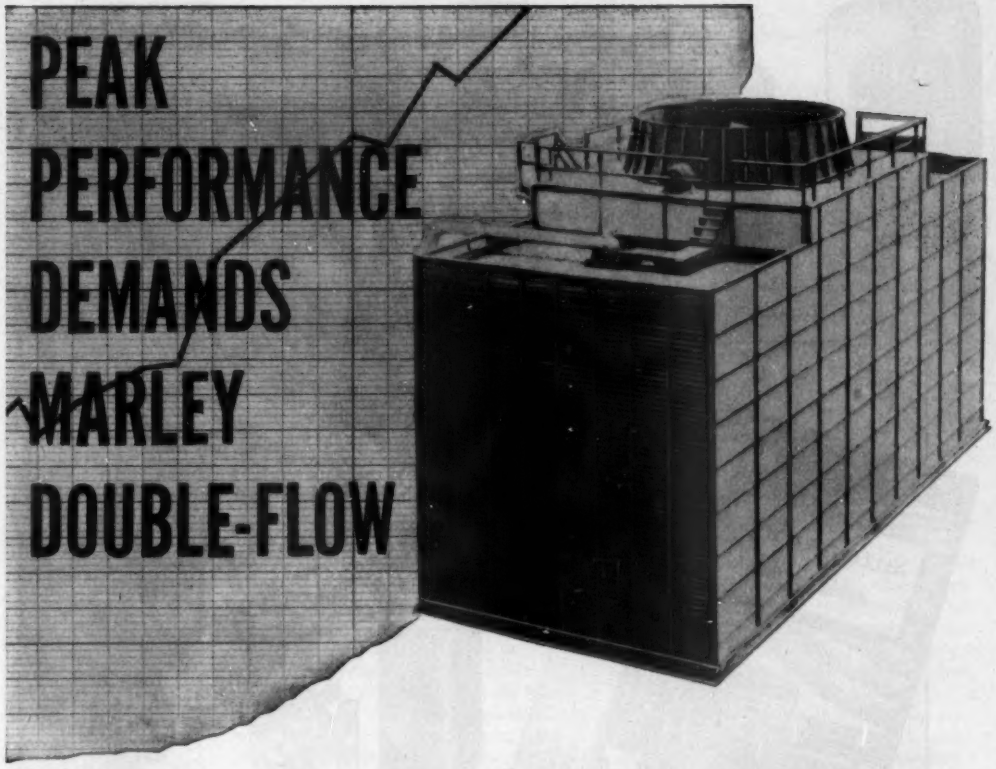

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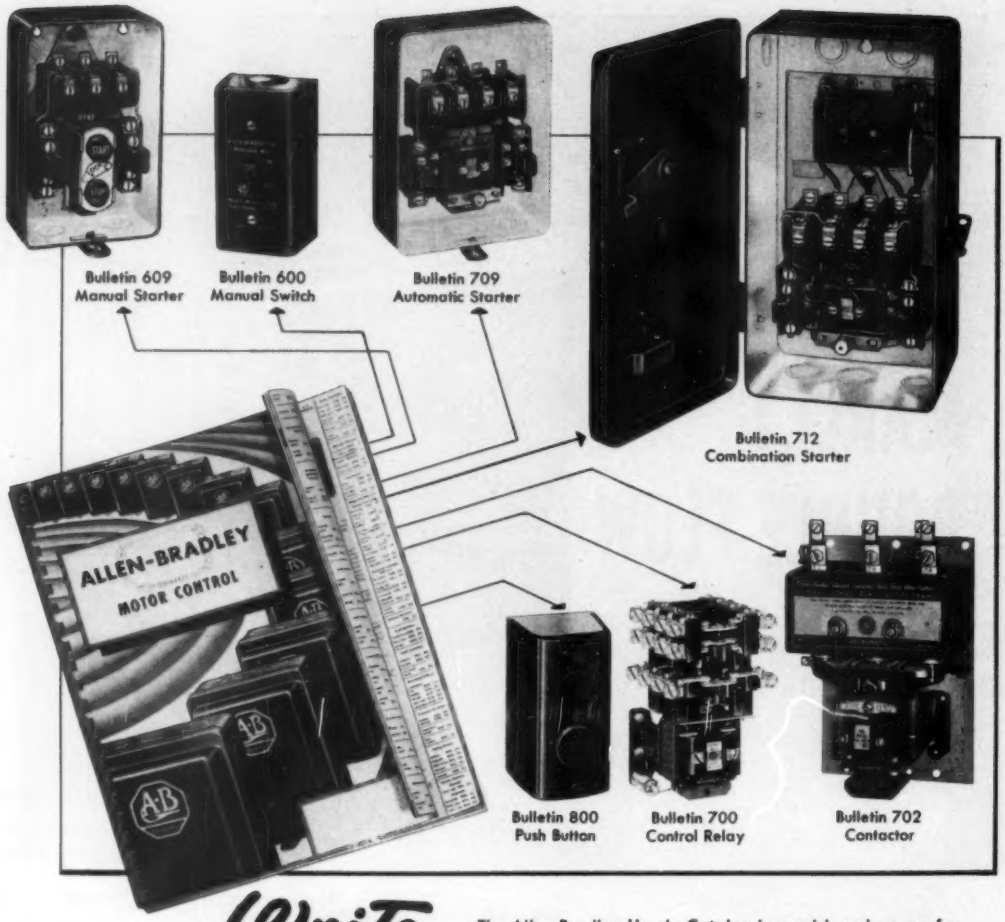

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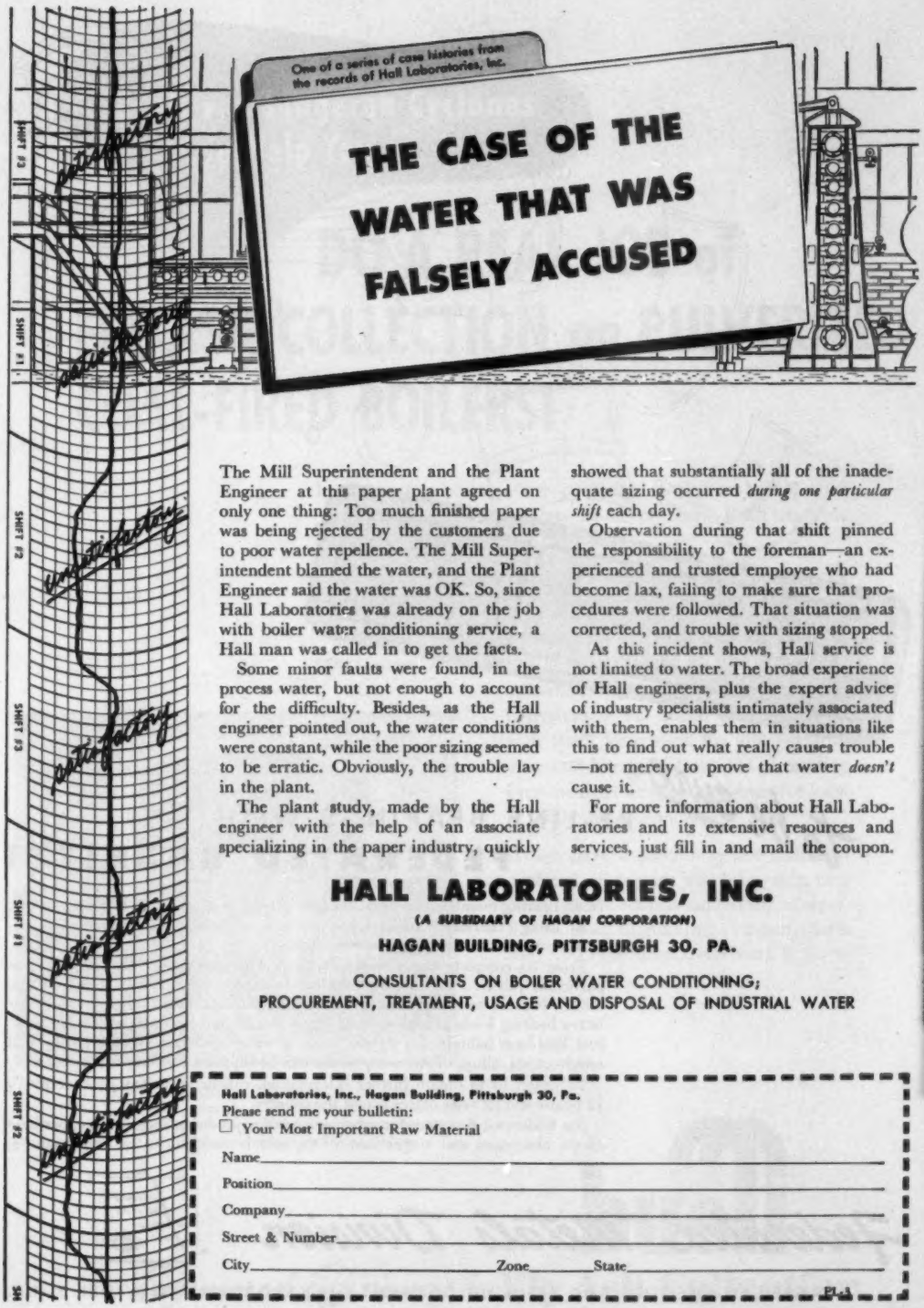

One of a series of case histories from the records of Hall Laboratories, Inc.

THE CASE OF THE WATER THAT WAS FALSELY ACCUSED

The Mill Superintendent and the Plant Engineer at this paper plant agreed on only one thing: Too much finished paper was being rejected by the customers due to poor water repellence. The Mill Superintendent blamed the water, and the Plant Engineer said the water was OK. So, since Hall Laboratories was already on the job with boiler water conditioning service, a Hall man was called in to get the facts.

Some minor faults were found, in the process water, but not enough to account for the difficulty. Besides, as the Hall engineer pointed out, the water conditions were constant, while the poor sizing seemed to be erratic. Obviously, the trouble lay in the plant.

The plant study, made by the Hall engineer with the help of an associate specializing in the paper industry, quickly showed that substantially all of the inadequate sizing occurred *during one particular shift* each day.

Observation during that shift pinned the responsibility to the foreman—an experienced and trusted employee who had become lax, failing to make sure that procedures were followed. That situation was corrected, and trouble with sizing stopped.

As this incident shows, Hall service is not limited to water. The broad experience of Hall engineers, plus the expert advice of industry specialists intimately associated with them, enables them in situations like this to find out what really causes trouble —not merely to prove that water *doesn't* cause it.

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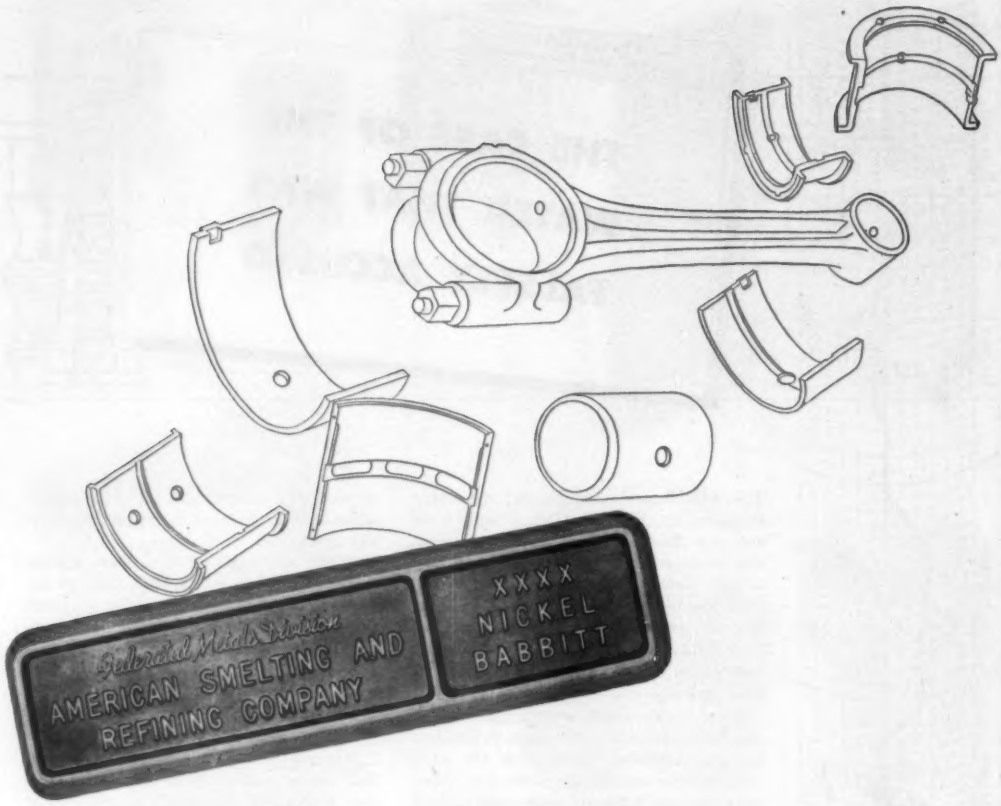

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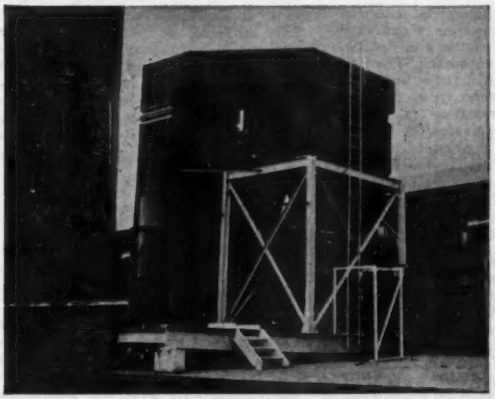
If you have a serious fly-ash collection problem, an inquiry will bring help in a hurry. Please address request for information to: Buell Engineering Company, Suite 5031, 70 Pine Street, New York 5, N. Y.



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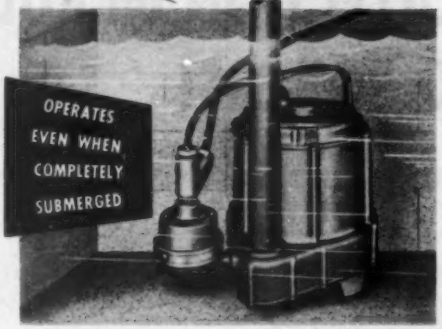

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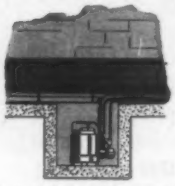

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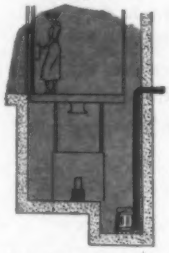

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LIGHTING MAINTENANCE

(Continued from page 59)

or an old area reactivated which involves rearrangement of existing lighting, the fixtures are cleaned prior to installation and fitted with new lamps. Cleaning of fixtures in the general office area is set up on a three month schedule.

In The B. F. Goodrich plants outside of Akron, some offices are air-conditioned. In these areas, cleaning of fixtures is sometimes reduced to once each two years. In one of these plants, built during World War II, factory lighting consists of war-time fluorescent fixtures with non-metallic reflectors. These are constantly being refinished. A number of metallic replacement reflectors was obtained and installed on a group of the lights, thus permitting the regular reflectors to be refinished and then re-installed. The program is continuous in this one plant, shifting from one group of fixtures to another on a circuit of the plant.

In these days of spiraling labor costs, serious consideration should be given to the use of higher wattages than might normally be used for a given area, in order to lengthen the time between cleanings. The unit cost of electric energy is stable compared to the hourly labor rate. Modern practice in the design of lighting systems has been to work toward a recommended average level of maintained illumination by taking into account ceiling and wall reflectance values, fixture mounting height, room index and maintenance factor, thus arriving at a certain number of fixtures for a given area. In view of conditions as they exist today, it appears desirable when certain pertinent data are unobtainable, to always use the more conservative estimating factors in design, thus resulting in higher maintained levels of illumination.

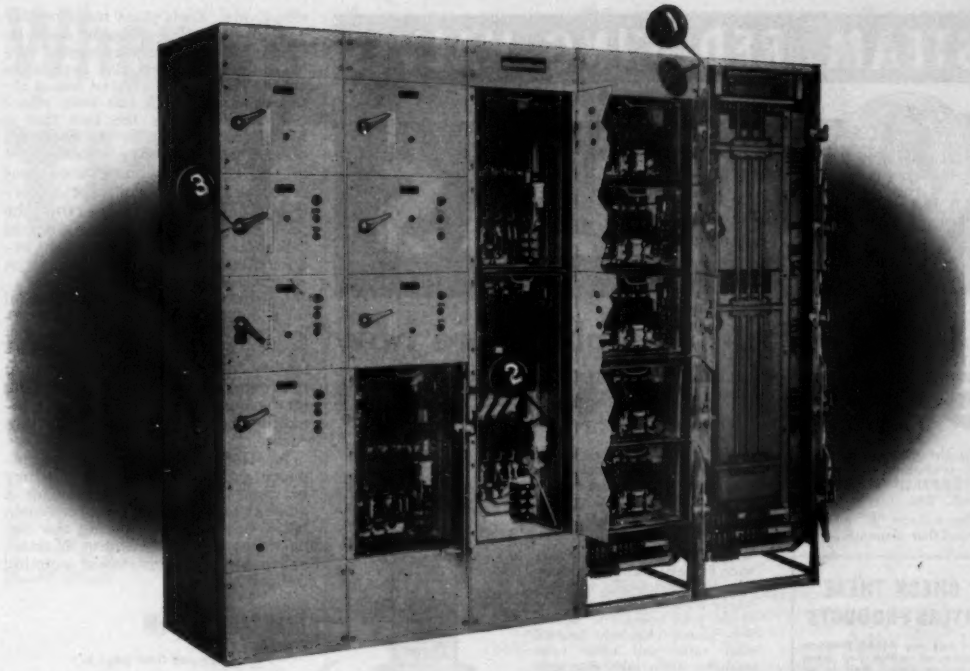
PLANNING OPERATIONS

(Continued from page 62)

of parts should be an automatic operation.

In order to best meet these requirements we have built up a spare parts catalog and established maximum, minimum stock figures. The catalog is indexed to the plant equipment numbers with an additional consecutive set of numbers added to the equipment numbers for each part. Opposite the part is indicated whether the item is stocked or not. If a number of pieces of equipment are identical, parts are listed for only one and the others cross indexed to it. Manufacturers drawing and part numbers are of course also listed.

I have described as fully as possible, in the time available, the manner in which our maintenance departments were organized in order to plan and schedule the work most



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3. **Safety Doors,** with safety-interlocking handles, remain on the panel when the starter unit is removed. Doors can be fastened closed to prevent entrance by unauthorized personnel.

For further evidence of a "well built" control center, check these features: self-cooling construction for foolproof ventilation, plug-in starter units, vertical and horizontal wiring troughs.

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At the right we show ATLAS TYPE "B," always a remarkable performer, and now a *much better* performer because it is STELLITED. The Pilot Valve is made entirely of that famous metal. The seat is STELLITE faced.

Try a Type "B" and you will find that it is unequaled for a service that demands tight seating and uniform reduced pressure.

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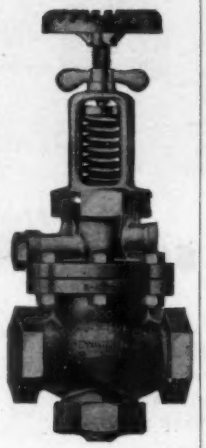
- ☐ Temperature Regulators
- ☐ Exhaust Control Systems
- ☐ CAMPBELL Boiler Feed Water Regulators
- ☐ Pump Governors
- ☐ Pressure Regulators
- ☐ Oil Control Cocks
- ☐ Humidity Controllers
- ☐ Thermostats
- ☐ Balanced Valves
- ☐ Control Valves

With this STELLITED valve wide fluctuations in initial pressure have practically no effect on the reduced pressure because of the pilot operation. Renewable piston chamber, internal pilot valve and main valve strainers. Main valve disc seats tight because disc is guided by center bearing cast integral with seat ring. Control diaphragm and controlled pressure port are integral with the valve body. The main valve is caused to open wide and close tight with slight changes in the reduced pressure through the operation of the pilot.

In addition, Type "B" is simple to maintain. Main valve disc and pilot valve are easily removed for cleaning or regrinding. The entire pilot valve can be lifted out by merely removing diaphragm and unscrewing pilot valve seat.



Type "B" for 250 lb. Service. Iron Body—Flanged Ends—Bronze or Nickel Alloy Seats and Valves—Pilot Operated. For initial working pressures from 20 to 250 lb. saturated steam: for reduced working pressures from 1 lb. to within 20 lb. of initial pressure in one stage. Sizes: 2½", 3", 4", 5", 6" 8".

Type "B" for 350 lb. Service. All bronze—Screwed or Flanged Ends—Bronze or Nickel Alloy Seats and Valves—Pilot Operated. For initial working pressures from 25 to 300 lb. saturated steam: for reduced working pressure from 1 lb. to within 20 lb. of initial pressure in one stage. Sizes: ½", ¾", 1", 1¼", 1½", 2".

Type "B" for 400 and 600 lb. Service with Temperature up to 900° F.—Steel body. Monel Metal, Stainless Steel and Nitralloy Seats—Stainless Steel Piston and Piston Chamber—Flanged Ends—Pilot Operated. For reduced working pressures from 1 lb. to within 30 lb. of initial pressure in one stage. Designed and built to withstand severe corrosion and wearing service under high pressure and temperature conditions. Sizes: ½", ¾", 1", 1¼", 1½", 2", 3", 4", 6". Series 40 for steam service to 400 lb. Series 60 for steam service to 600 lb.

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effectively. Each plant must modify and extend any system to meet its own particular requirements. We have tried to keep our system as simple as possible without losing effectiveness. That it has been effective is proven by the fact that a little over a year after its inception, unscheduled downtime maintenance, in our most demanding area, was reduced 19.6 per cent over a corresponding 4-month period the previous year. At the same time, in this same building, a 20 per cent reduction in frequency of inspection was accomplished.

Results like these are instrumental in: reducing plant hazards; facilitating control of product quality; increasing production; reducing possibility of product contamination; improving housekeeping conditions; increasing control of the maintenance forces; reducing maintenance costs.

As GM is uncontrolled maintenance and PM is controlled, it may be summed up thus: "A plant on a general maintenance, or breakdown basis, has the job running the department, while preventive Maintenance has the department running the job."

TRAMRAIL SYSTEM

(Continued from page 67)

six days a week with two molders each making fifteen molds per day. This called for six heats per day, five molds to each heat. At the same time the shop was averaging eight aluminum heats per day. By means of the overhead handling system it was possible for the two helpers to push all fourteen heats from the furnace room out to the pouring floor.

By the old hand method it would have been impossible for the two helpers to handle all these heats. It would have been necessary to employ additional help or to reduce aluminum casting production. The molders, too, would have required assistance.

WATER STRETCHING

A "water stretching" program at its Pekin, Ill., plant enabled the Quaker Oats Co. to provide for an increased production program without developing additional water sources. Based on methods then in use it was determined that the increased use would place total water needs at the rate of 393 gpm, critically close to the capacity of the well in use.

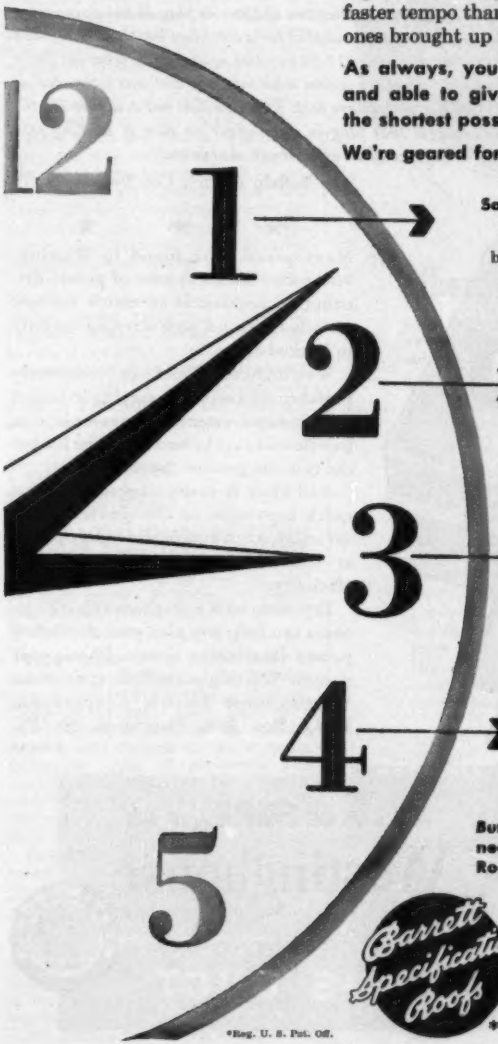
Hall Laboratories, Inc., surveyed the problem, and through a combination of water savings, increased use of what was formerly waste water, and well cleaning, hit upon the solution. The resulting savings due to these measures reduced water use and increased the amount available for future expansion of activities.

When you're roofing against TIME specify Barrett for ACTION!

The day of the "rush job" is back with us again. As a result of America's big rearmament program, you'll be expected to accomplish results at a faster tempo than ever before. New plants will have to be built and old ones brought up to standard . . . *in a hurry.*

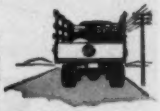
As always, you can count on Barrett to help you. Barrett is ready and able to give you the world's longest-lasting built-up roof in the shortest possible time.

We're geared for action four ways:



Save time on specifications. We have time-tested, scientifically calculated application specifications on hand for almost every built-up roofing problem. These are so foolproof that Barrett* Specification* Roofs can be *bonded* for 20 years, and generally last much longer. Approved by the National Board of Fire Underwriters—Class A.

Save time on delivery. Strategically located supply points enable us to rush materials to your contractor, and to your job when they are needed.



Save time with uniform materials. Barrett* coal-tar pitch and felt are made in our own factories, where their uniformity is rigidly controlled —an advantage in application as well as in final results. Only highest grade materials reach your job when you specify a Barrett Specification* Roof.

Save time on the job. Good men make for fast jobs. Barrett Approved Roofers have many years of practical experience, plus well-trained manpower, plus Barrett engineering help, to assure you the finest possible roofing job in the shortest possible time.

***But don't wait* until you're up against it before ordering necessary roof improvements. Call in a Barrett Approved Roofer today, or write us.**

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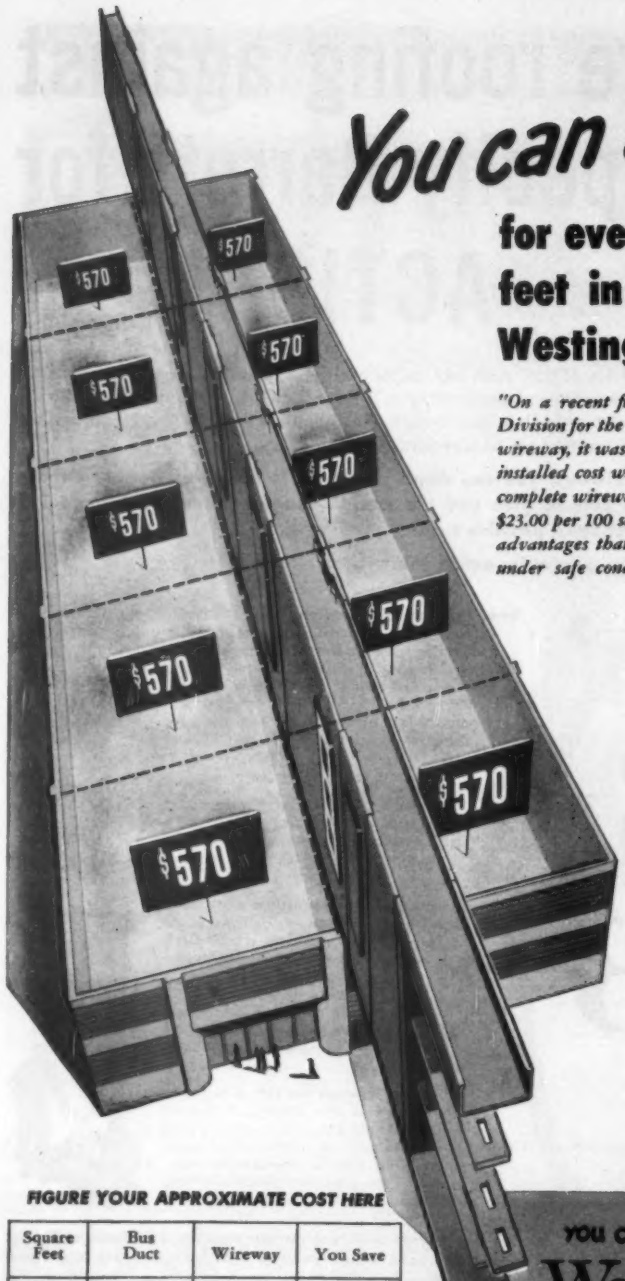

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NEW BOOKS

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Selection and Application of Capacitors

CAPACITORS FOR INDUSTRY by Bloomquist, Craig, Partington, and Wilson. Size 6 by 9 in.; 246 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $4.50.

HERE IS A helpful book which contains important information on the practical applications of capacitors in industry. Useful tables, curves and illustrative examples are included for speedy and accurate solutions.

To give you an idea of the material covered in the book several chapter titles are listed: harmonics and resonance, switching, fusing; release of power-system capacity; capacitor design, construction and characteristics; capacitor ratings, estimating prices, types of equipment; specifications for capacitor equipment; and others.

The book will be valuable to the industrial plant engineer, electrician, utility power salesman, consulting engineer and industrial power application engineer in answering many capacitor application questions. Answers can be obtained directly without the solution of the right triangle or use of complex algebra.

Practical Problems Solved with Graphs

FALK'S GRAPHICAL SOLUTIONS TO 100,000 PRACTICAL PROBLEMS, prepared and edited by Karl H. Falk. Third Edition; 6½ by 9¼ in.; 419 pp; cloth bound. Published by Columbia Graphs, Columbia, Conn.; 1950. Price $6.00.

THIS BOOK is a collection of worked-out problems which have been solved by the graphical method. There is no text. Each page is a chart which represents an infinite number of solutions to one or more particular types of problems. The examples included have been chosen with the purpose of giving the book the widest possible range of practical application.

Examples from mechanics, hydraulics, electricity, construction, physics, chemistry, agriculture, medicine, mensuration, measures and weights, have all been included, with the aim of giving the user a handy reference book of solved examples of the types of problems he is most likely to meet in his daily work.

All graphs have been constructed

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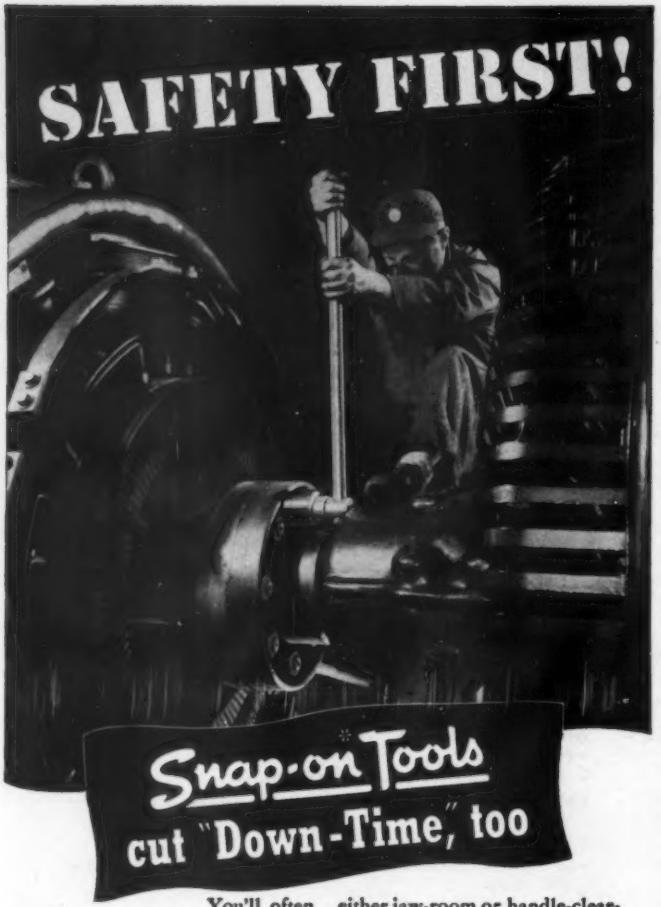

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so that only straight line connections are necessary. Each graph has been worked out to its most simplified form so that the diagram may be read with the utmost accuracy by persons not previously skilled in the reading of graphs.

In addition to giving such engineering information as the required strength of a beam, torsional deflection of a shaft and linear expansion of a steam pipe, the book also gives information on such subjects as the temperature of various cities to the amount of gasoline necessary to drive a car from Miami to Los Angeles.

Work Injury Statistics

WORK INJURIES IN THE UNITED STATES DURING 1948. Size 7¾ by 10¼ in.; 19 pp; paper bound. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 15 cents.

HERE IS a report which covers the tabulation on the occurrence of work injuries in the United States during 1948. Over 54,000 establishments with a total employment of about 11 million workers participated in the survey on which the report is based.

The five tables contain the following information: injury rates and injuries by extent of disability; changes in exposure, disabling injuries, and injury rates; distribution of all reported injuries resulting in permanent-partial disability; distribution of temporary-total disabilities, by duration of disability; and indexes of injury-frequency rates in manufacturing.

The report mentions that this is the first time since 1940 that the annual toll of disabling work injuries fell below 2 million. However, the number of injuries and most injury rates were still well above the levels prevailing in the years 1938 to 1940.

Cutting Time in Half

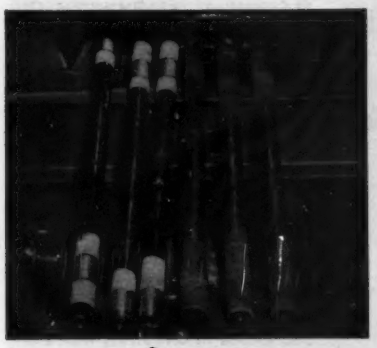
MOTION AND TIME STUDY, Principles and Practice, by Marvin E. Mundel. Size 6 by 9 in.; 457 pp including bibliography and index; cloth bound. Published by Prentice-Hall, Inc., New York, N. Y. Price $6.65.

THIS BOOK provides a systematic and practical treatment of present-day motion and time study. The development of basic principles is presented in such a manner that they may be understood and applied with naturalness rather than as clerical procedures.

The chapters proceed from an explanation of motion and time study to the human factor and then explain how to start the analysis. The chapters which follow, 5, 6 and 7, are applicable to the every-day needs of plant engineers. These chapters cover the process chart from product analysis to man analysis to

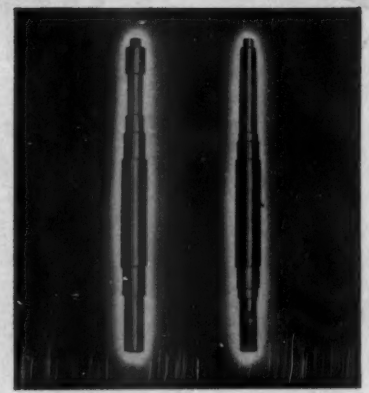
How you can safely cut your stockpile needs for machine part replacements

With the *new*, fast, easy-to-use metallizing process, you can quickly build up worn areas on a wide range of parts for machines you *use*, or salvage mis-made parts in equipment you *make*.



1 pound of metallized steel saves 15 lbs. in each of these six transmission shifter shafts. No rough-grooving or undercutting needed with the new metallizing process.

47 lbs. of stainless steel salvaged in each spindle by metallizing the small mis-machined sections. With the new, self-bonding Sprabond Wire, it's a 3-step process—just clean, spray and finish.



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a combination of these two phases.

Chapters 8, 9 and 10 delve further into the analysis of motion and time by use of operation charts, studying first all possible motions of a stationary worker and later combining this study with that of the machine.

Other chapters cover micromotion study, time study rating, recording standard practice, recording time values, objective rating and the application of motion and time study standards.

It is well to stress chapters 5 through 10, which, we feel, will be very helpful to plant engineers since they go into a detailed study of process and operation charts.

Handy Handbook On Electrical Transmission

ELECTRICAL TRANSMISSION AND DISTRIBUTION REFERENCE BOOK by Central Station Engineers of the Westinghouse Electric Corp. Size 8½ by 11 in.; 824 pp including index; illustrated; cloth bound. Available from Westinghouse Engineer, 306 Fourth Ave., P.O. Box 1017, Pittsburgh 30, Penna. Price $6.00.

THIS IS the fourth edition of this useful engineering tool which has become a handbook in the industry. It contains essentially the same material of the previous three editions with the addition of three new chapters—excitation systems, application of capacitors to power systems and power line carrier application.

The new book presents information gained in consulting with utilities and aiding in the solution of their transmission and distribution problems.

Several of the other chapters are mentioned to give you some idea of the scope of material covered; regulation and losses of transmission lines, relay and circuit-breaker application, wave propagation on transmission lines, grounding of power-system neutrals, and primary and secondary network distribution systems.

This reference book should prove very helpful in serving as a handbook to answer many of your electrical transmission and distribution problems.

All About Steam Turbines

STEAM TURBINES by Edwin F. Church, Jr. Third edition; 6¼ by 9¼ in.; 531 pp; illustrated; cloth bound. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price $6.00.

THIS IS the third edition of a standard text on this subject, and the developments of recent years have necessitated an almost complete rewriting of the original text.

Among the topic additions and enlargements in the new text you will find a more general treatment of steam turbine blading theory and performance with various degrees of

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reaction; variations of fluid flow through nozzles and blades at different radii; effects of sonic or near-sonic velocities on the flow in turbines; vibrations; high speed of rotation and large capacity; forms of governors suitable for turbines of various types and sizes; and performance data covering a wide range of sizes and types of turbines.

For those who wish to study blading design, the chapters devoted to these subjects are well illustrated with velocity diagrams and the mathematics for calculating blading is given in detail.

Plasticity and Creep of Metals

SYMPOSIUM ON PLASTICITY AND CREEP OF METALS, (STP 107). Size 6 by 9 in.; 68 pp; paper bound. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. Price $1.50.

THIS SYMPOSIUM covers four phases of plastic deformation and flow of metals. The material was presented at the First Pacific Area National Meeting of ASTM in 1949.

The papers and their authors are: The Experimental Exploration of Plastic Flow in Sheet Metals by L. R. Jackson and W. T. Lankford, Battelle Memorial Institute; Forming Parameters and Criteria for Design and Production by William Schroeder, Lockheed Aircraft Corp.; The Use of Creep Data in Design by H. C. Cross and L. R. Jackson, Battelle Memorial Institute and Super Creep-Resistant Alloys by J. W. Freeman, D. N. Frey, E. E. Reynolds and A. E. White, University of Michigan.

Guide to Industrial Management

INDUSTRIAL ORGANIZATION AND MANAGEMENT by L. L. Bethel, F. S. Atwater, G. H. E. Smith and H. A. Stackman, Jr. Size 6 by 9 in.; 851 pp including bibliography and index; cloth bound. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price $5.50

INCORPORATING the accumulated experience of the authors in the diverse backgrounds of production engineering, economics, industrial relations and administration, this text offers a comprehensive treatment of basic management principles as applied to all the major functions of an industrial enterprise.

This second edition carries new sections on production processes, waste control, plant and equipment maintenance, equipment replacement and other matters dealing with principles of cost reduction.

The book proceeds from the history of American industry to the organization and operation of an industrial enterprise. The operation phase covers such points as manufacture of the product, administration and industrial relations neces-

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But on the golf course you can see the results. In steam hook-ups on the other hand, bad performance may go undetected for years, even though the traps apparently are working properly.

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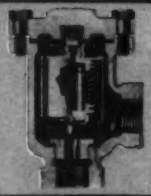
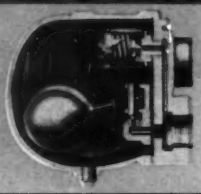
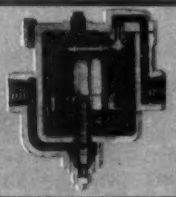
Thermostatic Trap



Float-Thermostatic Trap



Bucket Trap



Liquid Expansion Trap

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sary to maintain production, selling of the product and managing of the general offices.

There are several chapters which are directly applicable to the field of plant engineering. Such chapters as plant equipment and layout, inventories and materials handling, routing and scheduling, quality control, and methods analysis and control should be of interest to many readers. Plant engineers will certainly enjoy reading chapter 18 as it explains the field of plant engineering and enumerates the many duties the plant engineer is required to perform to keep the plant going.

Economics of Manufactured Gas from Coal

ECONOMICS OF FUEL GAS FROM COAL, by Battelle Memorial Institute, John F. Foster and Richard J. Lund, Editors. First edition; size 6¼ by 9¼ in.; 289 pp; cloth bound. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price $5.00.

THIS BOOK reports in detail a study and an intensive survey of the production of fuel gas from coal. The study covers both the technical and cost factors concerned, together with comparative cost data on other fuels, such as natural gas.

Some people may be a bit surprised at the conclusions the authors draw from this survey but the results certainly will not surprise most engineers. The last chapter gives a long and detailed analysis summarizing all the factors involved, concluding with: "fuel gas produced at the mines by the cheapest known methods and piped to consuming centers cannot compete with natural gas piped distances four or even six times as far."

The book contains a great deal of information on fuel costs and costs of transporting fuel that is not available elsewhere, and the book should be especially valuable to any reader interested in analysis of future fuel costs.

Study of Fluid Mechanics

HYDRODYNAMICS, a Study in Logic, Fact and Similitude, by Garrett Birkhoff. Size 5½ by 8¾ in.; 180 pp; cloth bound. Published by Princeton University Press, Princeton, N. J. Price $3.50.

THE BOOK is largely devoted to two special aspects of fluid mechanics: the complicated logical relation between theory and experiment, and applications of symmetry concepts.

A listing of the chapter titles will give you some idea of the contents of the book and the material which is covered: hydrodynamical paradoxes, recent progress in free boundary theory, modeling and dimensional analysis, group theory and fluid mechanics, and virtual mass and groups.

Wage and Salary Administration

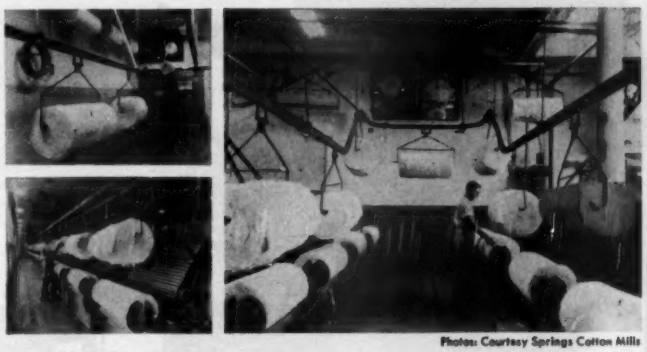
THE AMA HANDBOOK OF WAGE AND SALARY ADMINISTRATION. Edited by M. Joseph Dooher and Vivienne Marquis. Size 6 by 9 in.; 410 pp; cloth bound. Published by American Management Assn., 330 W. 42nd St., New York 18, N. Y. Price $7.50.

HERE IS A guide to principles and techniques of wage and salary administration and company experiences covering major types of job evaluation and wage administration plans.

The 34 chapters of the handbook cover such subjects as: techniques of the wage survey; case histories in wage and salary administration; joint labor-management job evaluation; salary administration for multi-unit operations; selected forms for job evaluation; and results of recent research into simplified wage administration. In addition, a model manual used by Armstrong Cork Co. to explain its wage program to employees is reproduced in its entirety.

The book is designed to meet the needs of companies that contemplate setting up a formal program of wage and salary administration for the first time as well as those who wish to review and improve their present programs in the light of tested and up-to-date techniques.

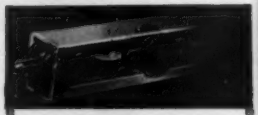
RAISE production...LOWER costs



Photos: Courtesy Springs Cotton Mills

with "Zig-Zag" Continuous Power Conveyors

Here you see how "Zig-Zag" solves a complex handling problem in the Springs Cotton Mills at Lancaster, South Carolina. In almost every imaginable industry, R-W "Zig-Zag" Conveyors are serving production and processing lines—increasing efficiency, cutting costs. Specifically designed to carry light loads through confined or crowded areas, "Zig-Zag" is adaptable to almost every plant condition or layout. And the savings effected with R-W "Zig-Zag" Conveyors are so substantial, the equipment pays for itself quickly—in most cases in less than a year! For further information, call, write, or wire our nearest office.



Engineered for Economy and Flexibility

- Horizontal and vertical units alternate in a continuous chain traveling through special steel tubing.
- Complete flexibility for installation in any plant. Easily installed, easily changeable to conform to plant alterations.
- SAFE—all moving parts are fully enclosed.
- Low first costs. Low Power Factor.
- Standard horizontal or vertical curves —two-foot radius.

1880 RICHARDS WILCOX R-W AURORA ILL. U.S.A. 1951

Reg. U. S. Pat. Off.

OVER 71 YEARS

Richards-Wilcox Mfg. Co.

AURORA, ILLINOIS, U.S.A. Branches in all principal cities

New Products and Methods

BLAST CLEANER

Midget size for small plants, or for special jobs in larger plants

The No. 0 Type EZ Hydro-Finish Blast Cabinet, weighing only 40 lb (where aluminum can be used for main housing), operable from either a ¼ in. compressed air line or any bottle of compressed gas, and boasting a 15 in. dia blast chamber, uses the same wide range of abrasives (as fine as 5000 mesh) as company's larger models and is designed to hold tolerances on blasted parts to within 0.0001 in.

This unit requires only 17 by 22½ in. of floor space; stands on legs of standard ½ in. pipe (or can be bench mounted); requires 110 v a-c to drive its filter and dust bag motor; consumes 50 to 20 cfm of air at 80 psi; and has a chamber light, right and left hand holes, quick-opening valve for leg operation, and an observation window.

The abrasive-liquid mixture is slurried and bubbled in a clear glass bowl of ½ gal capacity at the base of the unit. Two sizes of suction-type blast nozzles may be had. Loading and manipulation are through a large top plate. Unit is suggested for small parts cleaning, precision polishing and a wide range of surface preparation and cleaning. Costs $197. Pangborn Corp., Hagerstown, Md., Attention: B. H. Marks.

with the Swartwout **Airlift**

Centrifugal Fan Type Ventilator

Here's measurable *effective* exhaust capacity at low noise levels! Quietness alone in duct exhausters won't fill the bill if you fail to get capacity you need without wasteful size and cost. Swartwout Airlift centrifugal fan wheels have *certified ratings*. And Airlift ventilator design adds efficiency with streamlined fan inlet and oversize outlet opening. Turbulence and friction losses are cut to minimum. 14 sizes in a wide variety of capacities. Write for Bulletin 341D.

The Swartwout Co.

18511 Euclid Avenue • Cleveland 12, Ohio

Industrial Ventilation Specialists Since 1904

CONSTANT SERVICE CRANE

For smooth travel at higher than normal speeds, constant operation

New articulated trolleys carrying this crane are designed so each wheel bears its full share of the load in perfect alignment with the craneway tracks. Company points out that friction is eliminated by thrust bearings at load bearing points for perfectly articulated trolley travel.

Two new methods of propulsion are also available—fluid drive using the hydraulic coupling principle and a heavy gear drive consisting of slip ring motor with heavy duty gear reducer directly connected to drive shaft. Cranes can be interlocked for carrier travel beyond craneway areas. American MonoRail Co., 13107 Athens Ave., Cleveland, O.

SAFETY GLASSES

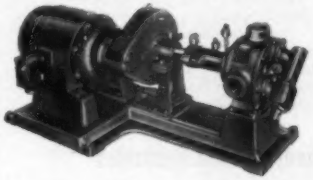
With absorptive lenses, for those whose eyes are sensitive to light

Designed for dress as well as safety wear, these glasses have Soft-Lite HT-51 lenses. These are hardened, flesh colored lenses said to possess all neutral absorption properties and transmission qualities of standard Soft-Lite lenses and to tone down all visible light rays evenly. Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.

ROTARY PUMPS

Totally enclosed, available in 20, 35, 50 and 92 gpm capacities

These pumps, previously available only in 200 gpm size, are widely used in pumping petroleum products and chemicals; the new smaller units are also suited for pumping all types of clean liquids, either indoors or outdoors. They are totally enclosed with oil-tight, water-tight guards and are designed for



safe use outdoors in all kinds of weather without a pump house or other protection when equipped with a totally enclosed motor.

Features of the new pumps include oil-tight cast iron gear case with oil gage, filler and drain plug; stainless steel pump shaft; extra long stuffing box. Ball check grease cups are standard on pump and pedestal bearings; other style grease fittings are optional, as is a relief valve on pump head. Viking Pump Co., Cedar Falls, Ia.

PACKAGE COUNTER

For conveyors, records each unit as it moves along the line

The Case Counter fits between sections of gravity belt, or live roller conveyors. A short, powered belt carries the package forward to a barrier

THERE'S A C-E STOKER THAT MEETS YOUR NEEDS EXACTLY

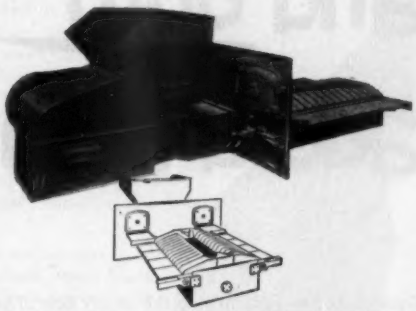
There is no such thing as an "all purpose" stoker. Each type has advantages that are fully realized only when matched with coals of definite characteristics under well-defined operating conditions.

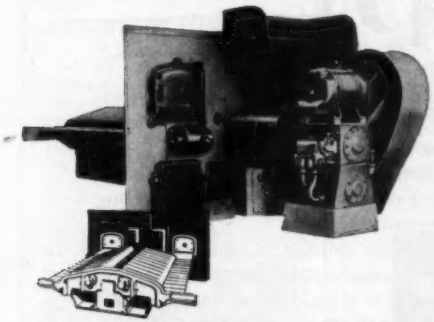
The importance of getting the *right* stoker is readily seen when you consider that the price you pay for it is only a down payment on the continuing cost incident to steam generation. Why? Because the cost of fuel burned every year throughout the useful life of the equipment far exceeds the original purchase price of the stoker. And, at today's coal prices this fact is of paramount interest to you.

Although the complete line of C-E stokers includes seven basic designs, one of the three types shown on the opposite page will prove to be most suitable in 4 out of 5 installations. Each of these stokers represents an outstanding value in its respective field. Each reflects the practical knowledge of fuel and operating conditions Combustion has gained through 65 years experience in stoker design and application.

You can assure yourself of top stoker performance by coming to C-E—stoker headquarters—the next time you are in the market. Since C-E engineers have at their disposal every type of stoker equipment they can afford to be completely impartial in recommending the installation which fits your needs *exactly*. B-408A

SKELLY STOKER UNIT Application Range — 20 to 200 boiler hp. (Approx.)
A compact, self-contained underfeed stoker. Designs for either anthracite or bituminous coal. Alternate fixed and moving grate bars assure lateral distribution of fuel and maintains a clean porous fire. Cantilever dump grates simplify ash removal. Integral forced-draft fan permits positive regulation of air-coal ratio. Variable-speed transmission. Automatic control is standard. Timken bearing equipped. Alemite lubrication.

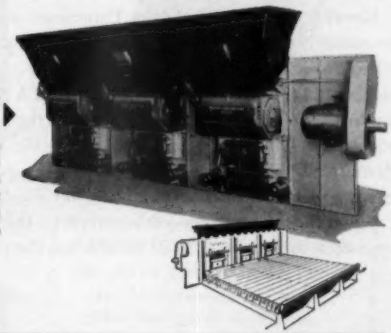




TYPE E STOKER Application Range — 150 to 600 boiler hp. (Approx.)
A single-retort underfeed stoker designed to burn a wide variety of bituminous coals, particularly those having caking and coking characteristics. Has ram type feed and reciprocating sliding bottom. Hollow, air-cooled grate bars are arranged in an alternately fixed and moving relationship to condition the fuel bed and assure its steady movement to the dump trays. Air supply is under zoned control. Provision for air over the fire. Available with steam, electric or hydraulic drive.

SPREADER STOKER Application Range — 150 boiler hp. up to units producing 200,000 lb of steam per hr, or more.

Available in both dumping grate and continuous discharge types, this simple, rugged stoker is designed to burn a wide variety of coals. Hopper, feeding and distributing mechanism, variable-speed drive and motor are combined in a compact unit. Grate surface is zoned for regulating air admission and to facilitate cleaning. All parts subject to wear are readily accessible. Rate of fuel feed and air supply may be regulated over a wide range and are readily adaptable to automatic control.



C-E

Combustion Engineering–Superheater, Inc.

200 Madison Avenue • New York 16, N. Y.

Step up production and don't add a man

Equipment breakdowns stop the steady flow of production. Eliminate breakdowns and you increase production without adding a man.

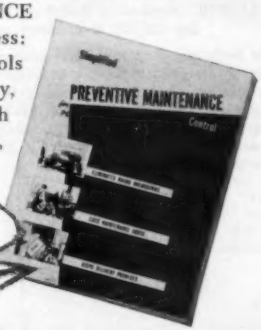
A Kardex Visible Maintenance System *automatically* indicates which machines need preventive attention. You route maintenance men to the right job, on the right machine, at the right time.

Here's how the system works. Experience and performance are combined to set up a tested, inspection schedule. Kardex colored signals indicate . . . *automatically* . . . those items due for inspection. A "Floating Inspector's" record is withdrawn from the Kardex pocket, filled out with instructions specific to the checkup to be performed, and routed to your maintenance men as a work order and report sheet.

When the maintenance job is complete, the maintenance man checks off what he did and the card is returned to its place, *automatically* signaling job completion. Then, the Kardex signals are advanced to the next date specified.

The quick result: *less* clerical help and a minimum of time-wasting paperwork, thanks to the "Floating Inspector's" record.

To establish, once and for all, complete control over your maintenance activity and to hold maintenance inventories at a healthy low level, write for your free copy of KD 449, SIMPLIFIED PREVENTIVE MAINTENANCE CONTROL. Address: Management Controls Reference Library, Rm. 1781 315 Fourth Avenue, New York 10, New York.



FREE

Remington Rand

THE FIRST NAME IN BUSINESS SYSTEMS

and contact with this causes an air-cylinder to raise the front of the package. The belt then propels the package over the barrier and deposits it on the live roller discharge unit while the numbering machine registers the count. The barrier then resets itself to stop the next package. This positive stop is provided to eliminate accidental release and assure accuracy of count.

This counter is a self-contained unit including motor-driven belt-type inlet mechanical or electric counter. Standard units are for use with conveyors 16¼ in. between rails. Other widths can be supplied. Alvey Conveyor Mfg. Co., 3201 S. Broadway, St. Louis, Mo.

POWER PACKAGE

Load center unit substation for low-voltage regulated a-c service

The Inductrol Power Pack incorporates in one steel housing an air circuit breaker, a dry-type transformer, and an air-cooled induction regulator. Available in either single- or three-phase ratings, the unit has a capacity from 15 to 100 kva, with incoming circuit rated 480 or 600 v, 60 cycles, and a regulated output at 120/240 or 208Y/-120 v.

With these regulating units, power can be brought to load area at relatively high voltage with substantial savings in cable. At the load center, the voltage is stepped down to value required by the load being served and automatically maintained at that level.

In addition to lighting, the Inductrol Power Pack can be used to regulate power supplied to resistance heating

SANDBLAST CABINET

Is small, handy, for cleaning tools, dies, piston rings

Complete with two light fixtures for illuminating interior, an exhaust fan and dust bag, this cabinet is primarily intended for cleaning small metal parts by the use of soft abrasives, such as ground corn cobs or ground nut shells, to remove surface impuri-

ties without scoring the metal. It can also be used with sand or metal abrasives.

The cabinet has two rubber sleeves (with rubber gloves attached) for both arms of the operator. It measures 14 by 17 in. and can be placed on work bench, connecting it to a compressed air line and to a 110-v lighting circuit. The W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland 2, O.

Rubber-base (Parlon®) Paints

GIVE EXTRA PROTECTION

against Acids and Alkalies

Where other paints fail because of acid or alkaline plant conditions, it may pay you to specify corrosion-resistant, rubber-base paints. For concrete and most metal surfaces, paints properly formulated with "Parlon" (Hercules Chlorinated Rubber) are unsurpassed for resistance to common destroyers of maintenance paints. Besides alkali and chemical resistance, these paints have outstanding wear resistance, dry fast, and are easy to apply.

More than 500 paint manufacturers now offer one or more rubber-base paints made with chlorinated rubber. These maintenance paints may cost a little more per gallon, but usually cost far less per square foot per year. We'll be glad to supply the names of several firms in your locality who can advise you.

HERCULES POWDER COMPANY
966 Market St., Wilmington, Del.
Send further details on "Parlon" paints and names of suppliers.

Name_____
Company_____
Address_____
_____
CR51-1

and infrared heating equipment, electronic apparatus, precision instruments and control circuits. Company points out that since unit is completely enclosed in metal it can be installed indoors without fireproof vaults. It can also be mounted overhead. Unit Equipment Div., General Electric Co., Schenectady 5, N. Y.

FUSIBLE PANELBOARDS

Provide plug fusible branches with heavy-duty toggle switches

For lighting and appliance branch circuit control the new NTPR panelboards are available from 4 to 40 circuits for use on either a-c or d-c applications. Construction features embody a 17 in. wide, 4¼ in. deep box with 4 in. wide wiring gutters and ample knockout in ends and sides. Four branch circuits are contained in the one-piece molded bakelite blocks which form the heart of these low cost panelboards. Square D Co., P.O. Box 272, Roosevelt Park Annex, Detroit 32, Mich.

UNIT AIR FILTER

Designed to operate efficiently at air velocities up to 500 fpm

The Type HV Air Filter is made of corrugated strips of fine mesh wire in which corrugations taper so that when two strips are placed together they form a series of pyramid shaped pockets. The small ends of the pockets are closed to the air flow to eliminate open air passages through the media. Filter can be serviced with washing and charging tanks or reconditioned by washing out the accumulated dust with a hose and spraying with filter adhesive. American Air Filter Co., Inc., Louisville 8, Ky.

WEIGHT INDICATOR

Is redesigned scale with larger dial diameter for closer readings

This portable scale has a 16 in. dia dial, and pivots and bearings of highly polished, hardened tool steel. Full compensation for tare loads has been provided and a 360 deg ball-bearing swivel hook is standard. Accuracy is given as within one division of the indicated reading at any point on the dial

Built for weighing such materials as steel, wire, lumber, cement, tobacco, scrap, drums, crates, poles and machinery, this indicator is suggested for use where long or bulky objects can't be moved to a central weighing point. W. C. Dillon & Co., Inc., 1421 S. Circle Ave., Forest Park, Ill.

The "MASTER" Line
OF MATERIALS HANDLING EQUIPMENT

The Most Complete Line of Materials Handling Equipment on Wheels

Buy the type of machine that fits your job.

Write TODAY for one or more of these new catalogs . . .

(24) Master JackLift Electric Trucks and JackStacker Electric Trucks.

(25) SpaceMaster Electric Fork Trucks.

(26) Master JackLift Trucks, Hydraulic and Mechanical Handlift Trucks, WeldMaster Skid Platforms.

(27) SpaceMaster Gas Fork Trucks.

(28) PowerMaster Stackers, Lifters, Handy Hoisters, Portable Cranes.

(29) FloorMaster Trucks.

(30) ToteMaster Gas Trucks.

(31) Loadmaster Racks for Pallet, Platform, Barrel, Drum, Bin, Unit Loads.

The "MASTER" Line

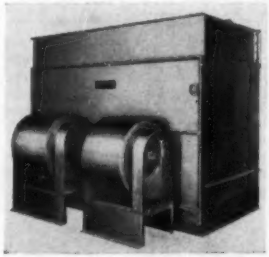
LEWIS-SHEPARD PRODUCTS INC.
162 Walnut Street, Watertown 72, Massachusetts
Midwest Plant: Crawfordsville, Ind.
Sales & Service in Principal Cities

COOLING TOWERS

Blower type, in single and double fan models

Air enters these Dry-Fan Cooling Towers through a squirrel cage fan at the bottom and is exhausted through redwood drift eliminators at the top. For indoor installations adaptor hoods are available to facilitate connection of exhaust ducts.

The 2-B Series is a single fan model in nine sizes, with capacities from 3 to 30 t of refrigeration.



Sizes of these compact towers range from 2 by 2 by 6 ft to 6 by 6 by 7½ ft. The 2-BB Series have two double-inlet squirrel cage blowers and come in four sizes with refrigeration capacities from 32 to 60 t, and dimensions from 4½ by 9 by 7½ ft to 6½ by 11 by 7½ ft. Both models are said to offer exceptionally quiet operation. Binks Mfg. Co., 3122 Carroll Ave., Chicago 12, Ill.

RUST PREVENTIVE

Thin film type, has surface coverage of 390 sq ft per gal

No. 6, newest of company's line of No-Rust Compounds, is for protection of metal surfaces against corrosion in either indoor or outdoor exposure during domestic and overseas shipment and for long storage periods. It has no tendency to settle or separate in storage, company reports, and due to its excellent adhesion this coating, when once applied and dried, won't crack,

JENKINS PRACTICAL PIPING LAYOUTS 54

How to plan

STEAM DESUPERHEATER PIPING CONNECTIONS

In plants where steam is required at lower than boiler pressure, it is usually obtained by means of pressure reducing valves. This low pressure steam is highly superheated and the superheat must be removed before it can be used in low pressure equipment.

The system shown employs pressure reducing valves and a desuperheater. These valves in turn operate water regulator valves which allow water at high pressure from the boiler feed pumps to flow to the desuperheater nozzle. An automatic regulator controls the amount of water flow based on the downstream temperature.

For the distribution of high pressure steam, Jenkins Fig. 1012 Cast Steel, Outside Screw and Yoke Gate Valves are recommended. Ruggedly designed to withstand pressure strains and rapidly vibrating steam currents, these valves, when fully open, permit an unobstructed flow. Screwed-in seats are replaceable and valves can be packed under pressure.

Consultation with accredited piping engineers and contractors is recommended when planning any piping installation.

A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

Jenkins Bros., 100 Park Ave., New York 17; Bridgeport, Conn.; Boston; Philadelphia; Chicago; San Francisco; Atlanta. Jenkins Bros., Ltd., Montreal.

NEW BOOK OF PIPING LAYOUTS, Nos. 26 to 50
A new book of Jenkins Practical Piping Layouts — Nos. 26 to 50 — will be sent on request. Mail coupon for your copy.

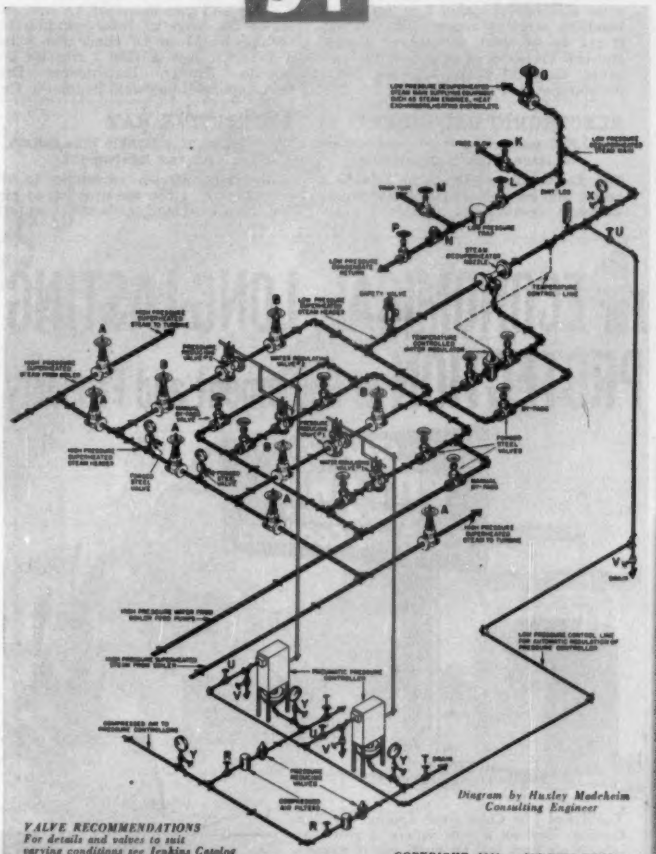


Diagram by Huxley Madeheim Consulting Engineer

VALVE RECOMMENDATIONS
For details and valves to suit varying conditions see Jenkins Catalog

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Code	Quan.	Jenkins Valves	Service
A	5	Fig. 1012 Cast Steel Gate	High Pressure Superheated Steam Distribution
B	4	Fig. 1012 Cast Steel Gate	Pressure Reducing Valve Shutoff
G	1	Fig. 1009 Cast Steel Gate	Low Pressure Desuperheated Steam Shutoff
K	1	Fig. 106-A Bronze Globe	Condensate Free Blow
L	1	Fig. 670 Bronze Gate	Condensate to Trap Shutoff
M	1	Fig. 106-A Bronze Globe	Trap Test
N	1	Fig. 92 Bronze Check	Prevent Condensate Backflow
P	1	Fig. 670 Bronze Gate	Condensate Shutoff
R	2	Fig. 106-A Bronze Globe	Compressed Air Supply to Pneumatic Controllers
T	2	Fig. 106-A Bronze Globe	Compressed Air Line Drains
U	3	Fig. 106-A Bronze Globe	Pressure Control Line Drains
X	1	Fig. 741-G Bronze Needle	Pressure Gauge Control
Y	3	Fig. 741-G Bronze Needle	Compressed Air Pressure Gauge Control

JENKINS BROS.,
100 Park Ave., New York 17, N. Y.

Please send Book of Piping Layouts Nos. 26-50.

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Company .....

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JENKINS
LOOK FOR THE DIAMOND MARK
VALVES SINCE 1864
TRADE JENKINS MARK

Jenkins Bros

chip, scale or disintegrate at temperatures down to 0 F, nor will it flow at temperatures up to 190 F.

No-Rust No. 6 deposits a coating not exceeding 0.008 in. thick at 70 F and dries sufficiently within 4 hr to permit handling without removal or coating. It can be brushed, sprayed or dipped, and can be removed with suitable solvents. Gulf Oil Corp., 722 Gulf Bldg., Pittsburgh 30, Pa.

ELECTRONIC RECORDER

For measuring rotor temperature in large electric generators

The Electronik, designed to provide a better and more economical instrument to assist operators in avoiding overloads, also furnishes a 12-in. strip chart record which can be used as a guide for gradually cooling a generator.

This recorder has a range of 0 to 150 C, limit error of 1.5 deg, dead zone of 0.3 deg and pen speed of 1.4 min full scale. Its range of rotor winding resistance is 0.1 to 4.0 ohms and it has a dielectric test of 1500 v rms for one minute. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

PROTECTIVE HAT

Made of washable blue taffeta, is cool and lightweight

With more women returning to the plants comes again the problem of giving them headgear that's safe, comfortable and attractive. The Ray-ve, designed to meet this need, is cool and lightweight to avoid scalp perspiration which tends to oily hair and itching—a chief objection to heavy hats. Styled to prevent tufting the hair in front, the Ray-ve features a snood, ideal for curls or chignon and roomy enough to take care of any amount of hair. It's becoming to all women, say company spokesmen, and once adjusted should require no further attention. The price is $13.50 per dozen. Safety Div., The Boyer-Campbell Co., 6540 St. Antoine St., Detroit 2, Mich.

CIRCLE CUTTER

For production and experimental use, cuts metal, plastic, wood

The Micro Circle Cutter is adjustable in an infinite number of hole diameters within its range. A micrometer type adjusting screw is used for precise settings, and an improved method of locking the beam is incorporated for easier, quicker operation.

The cutter features heavy construction of main beam and body and two types are available—one with round shank for drill presses or hand drills, and one with square tapered shank for hand braces. Maximum hole diameters are 4 and 6 in. Cutters have high-speed ¼ in. steel cutting bit. Precise Measurements Co., 942 Kings Highway, Brooklyn 23, N. Y.

For ECONOMICAL, LONG-LASTING PROTECTION of Equipment and Property

You'll find Pitt Chem Cold Applied Tar Base Coatings ideal for a wide variety of protective jobs. Made from coal tar pitch, one of nature's most impervious protective materials, they're easy to apply, relatively low in cost, and effective against most corrosion conditions.

The uniform top quality of Pitt Chem Cold Applied Tar Base Coatings is assured by the close production control which results from our completely integrated manufacturing operation. If you're looking for an economical, dependable way to add years of service to your plant's physical assets, see your nearest Pitt Chem man . . . or write for new booklet, "Control Corrosion through Pitt Chem Protective Coatings".

PITT CHEM
Industry's Most Comprehensive family of Protective Coatings

- ★ Hot Applied Tar Base Coatings
- ★ Cold Applied Tar Base Coatings Series 100
- ★ Alkyd Base Coatings—Series 200
- ★ Chlorinated Rubber Base Coatings—Series 300
- ★ Vinyl Base Coatings—Series 400
- ★ Phenolic Base Coatings—Series 500

See Your Nearest Pitt Chem Man

PROTECTIVE COATINGS DIVISION

W & D 3480

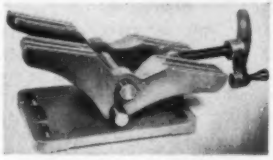
PITTSBURGH COKE & CHEMICAL CO.
GRANT BUILDING, PITTSBURGH 19, PA.

OFFICES: New York • Chicago • St. Louis • Tulsa • Houston • Los Angeles • San Francisco

TILTING MOTOR BASE

Is lightweight, adjusts to fit various fhp motors

Manufacturer says this is the lowest priced of adjustable motor bases and in addition to being used with variable speed pulleys, it acts as a belt tightener and can be used for easy belt changing on cone step pulleys. Speed changes can be made while machine is in



operation. It is designed to maintain belt tension and alignment. Speed control is by hand screw adjustment.

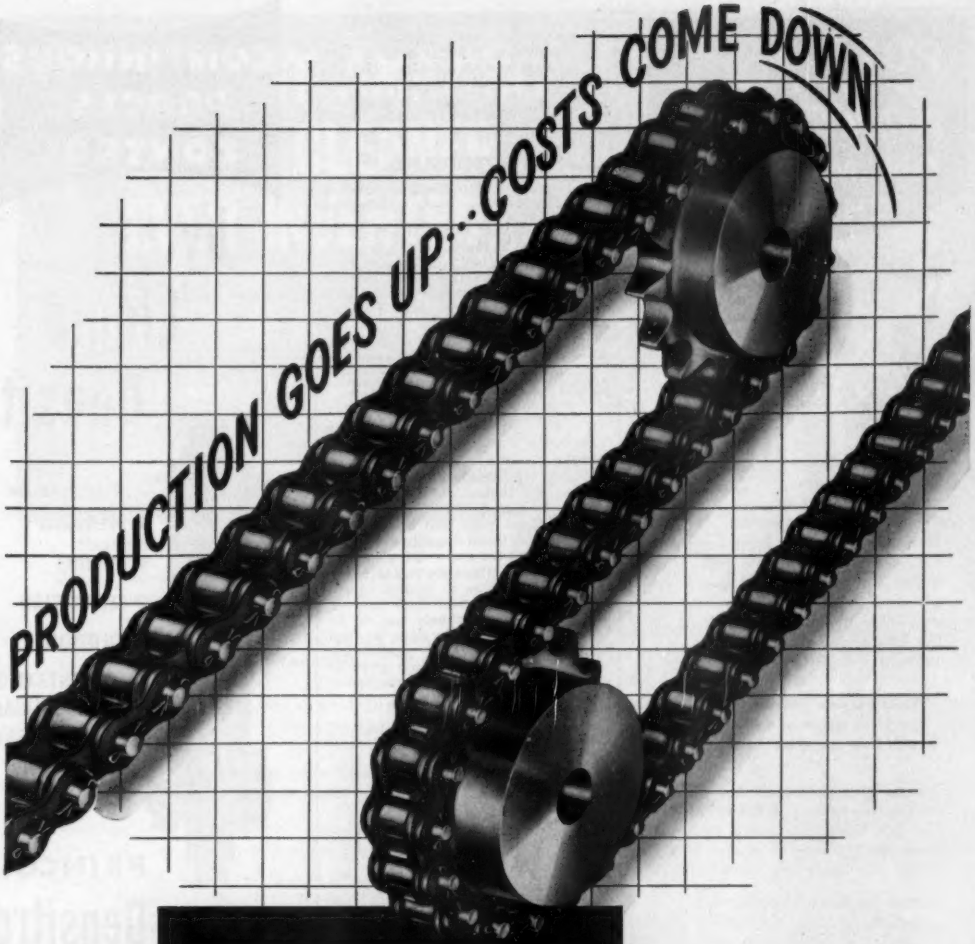
Base is only 5½ by 7 in. in size and its shipping weight is 10 lb. It costs $6.00. The Lovejoy Flexible Coupling Co., 5191 W. Lake St., Chicago 44, Ill.

SAFETY LADDERS

Double step type, afford increased safety and save time

Because it has steps on both ends, two or more persons can use Model 3-Sa ladder at one time on large assembly jobs. When no one is on the ladder, it rolls easily on swivel casters. The weight of a person causes the spring-mounted casters to deflect so the rubber tipped legs engage the floor and the ladder will not roll.

Ladder frame is welded tubular steel;



with- **WHITNEY**
CHAIN DRIVES

Service records prove the unusual ability of Whitney Chain Drives to deliver full rated horsepower day in, day out, without failure. To you, as a designer or user of equipment, this means time and dollars saved. Production goes up *and stays up*, while *costs come down.*

HERE'S WHY — the rolling contact of finely finished, alloy steel chain, meshing into accurate, cut tooth sprockets eliminate power loss because there is no slippage or friction loss. They deliver constant power smoothly and efficiently.

In addition, they absorb shock loads without breakage. And Whitney's alloy steel construction assures exceptionally long operating life . . . a vital point in keeping maintenance costs down.

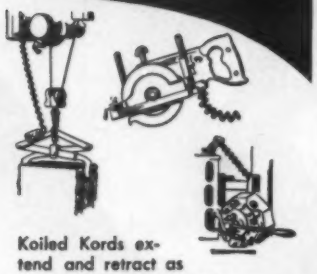
But that's not all . . . Whitney Chain Drives simplify design problems. They can be operated on long or short centers without tension or excess bearing loads . . . drive shafts clockwise or counter-clockwise, simultaneously. They can be installed or taken off without dismantling shafts or bearings.

And Remember Whitney Service

In addition to the service facilities of more than 130 Whitney Distributors, Whitney maintains a network of 15 Field Engineering Offices, located throughout the country. The experience gained through more than 50 years of solving drive problems is at your service. From the complete line of Roller, Silent and Conveyor Chains, Whitney Engineers can recommend, without bias, the proper type of drive for your application...the chain drive which will give you the best service at lowest cost. Consult your nearest Whitney Field Office or write us direct for catalog and complete information.

WHITNEY CHAIN COMPANY
232 HAMILTON STREET, HARTFORD 2, CONN.

PUT
Koiled Kords
ON MACHINES
THAT MOVE



Koiled Kords extend and retract as the machine or part moves. There's no dangling, hanging cord to catch, tangle and break. Koiled Kords cut replacements to a minimum and eliminate many hazards. For efficiency, economy and safety use Koiled Kords.

Write on your business stationery for a sample of Koiled Kord with from one to six conductors.

Where straight cords are safe and efficient use **DYNAPRENE** Flexible Cord, the extra tough cord that provides extra life under all operating conditions.

Write for descriptive DYNAPRENE Bulletin.

Be sure to specify Whitney Blake type SO or SJO for your flexible cord needs.

Koiled Kords

BOX K, NEW HAVEN 14, CONN.

Canadian Koiled Kords Distributor:
R. D. Flack & Co., Ltd., Oshawa, Ont.

steps are expanded steel to provide a non-slip surface and welded to bar stock for rigidity. Ladder is 30 in. high, 17½ in. wide and 48 in. deep. Top step has a 20 in. tread; others have 7-in. treads. Ladder is finished in aluminum paint. Ballymore Co., 139 Pennsylvania Ave., Wayne, Pa.

GLASFAB MEMBRANE

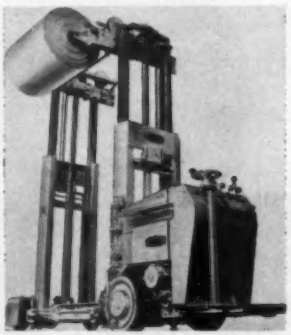
For use with asphalt coatings in waterproofing, roof maintenance

Due to the critical cotton situation, this manufacturer of asphalt coatings is discontinuing processing of cotton fabric for coating reinforcements and will distribute Glasfab membrane for this purpose. Glasfab is made with Fiberglas yarn, woven into mesh fabric and treated with asphalt. Its high tensile

ROLL HANDLING TRUCK

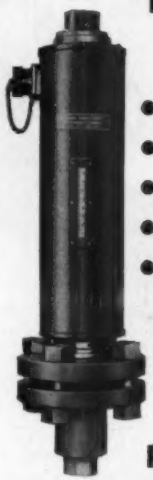
Is especially designed unit for use in dark, narrow aisles

This truck was built to handle 1500 lb rolls, 32 in. dia and 42 in. long in and out of five high storage racks along both sides of 54 in. wide aisles. It services a room holding 1200 of these rolls and operates in darkness. A built-in signal system lets the operator know the aisle and his position in the aisle as the truck moves along. Due to limited clearances even deflection and wear of the rubber-tired wheels had to be overcome and this was done by four hydraulically operated positioning pads on the truck which prevent movement to the truck horizontally, and position it vertically.



While traveling between columns of rolls, in racks, the truck is steered by guide rollers running against the side of the aisle tracks. In other places it is steered manually. Electric storage battery power moves the truck and runs the hydraulic pumps which control all other motions (hydraulically interlocked to minimize human error). Once the truck reaches its position in the aisle a few controls are set and the carriage automatically raises to the proper level, moves sideways, picks up or deposits a roll, and returns to center position where carriage lowers to normal position. Additional information on this specialized equipment in company's Master line is available. Lewis-Shepard Products, Inc., 256 Walnut St., Watertown 72, Mass.

CONTINUOUS PROCESS CONTROL
by
Liquid
Density



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- MIXING
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ECONOMICAL! RECLAIMS AND RE-USES ABRASIVE

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Hundreds of satisfied users. Examples:

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"Fulfilled our expectations so well we are ordering another:" *Chicago Transit Authority.*

"Vacu-Blasted sheets are superior to ground sheets:" *National Electric Welding Machines Co.*

Vacu-Blaster is the revolutionary new way to blast-clean metal, wood, concrete, brick. Vacuum pick-up eliminates flying dust and dirt. Welders and painters can work right alongside Vacu-Blaster. Operators do not need protective clothing.

It's portable. Perfect for cleaning tanks inside and out. Leaves no mess. Used on ships and other vehicles to remove paint and rust. Brewers use it for cleaning vats. Shippers use it for cleaning inside tank cars. Pipe and steel drum makers use it for edge-cleaning sheets prior to welding. Food processors use it for cleaning floors, walls and ceilings. It can be adapted to blast-clean a thin strip or an entire surface on production line or elsewhere.

It's economical. Vacu-Blaster reclaims and re-uses abrasive.

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VACU-BLAST CO.

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We would like your free Vacu-Blaster catalogue____. Wish to arrange for demonstration____. Our problem is_____

Name_____ Position_____

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Keller Hoist lowers a load of parts into heat-treating furnace

KELLER AIR HOIST for LOW MAINTENANCE

Where the going is "tough" for an ordinary hoist, the Keller Air Hoist stands up and gives trouble-free service . . . for example, in locations where it is exposed to extreme heat, oil fumes, and other conditions that are "murder" to ordinary equipment.

Users will tell you their Keller Hoists require a minimum of maintenance, have much less "down time," and cause fewer production delays.

Other advantages include light weight (30 lb*), small size (5" x 5" x 15"*), variable speed (from a creep to 17 fpm*), and safety.

*for 1000-lb Hoist. Capacities of 300, 500, and 2000 lb are also available.

Air Hose Trolley

Keeps air hose conveniently suspended, permitting it to follow a trolley-suspended Keller Air Hoist.

Keller Air Hoists, Hoist Trolleys, and Hose Trolleys are available through Keller sales offices, or direct from the factory.

KELLER

Pneumatic Tools

KELLER TOOL CO., GRAND HAVEN, MICH.

strength, heat and rot resistance and immunity to dampness are said to make it ideal for both emulsion and cutback asphalt coatings. Also its high strength to weight factor is expected to result in added economy by greater support of the bitumen when used with quality asphalt coatings and mastics. The membrane will be handled in widths from 2 to 36 in. and in rolls 50 yd long. Industrial Products Div., The Flintkote Co., 30 Rockefeller Plaza, New York 20, N.Y.

PORTABLE LIGHT

For emergencies, gives 80 hr continuous light per battery charge

Designed for use in defense plants and for use in emergencies by police, fire, first-aid, rescue squads, the Type CDU Civilian Defense Light is powered by a heavy-duty rechargeable long life battery. A special 2-filament bulb furnishes a work light for 80 continuous hr on one filament—longer if used intermittently — or a higher powered floodlight for 20 consecutive hr on the second filament. A thumb-operated 3-way toggle switch controls both filaments. Light is easily handled, has a shatterproof lens, cast aluminum case. Carpenter Mfg. Co., Somerville, Mass.

TRACTOR-SHOVEL

Has 1¼ cu yd bucket; with 60 hp gasoline or diesel power

The engine of the new Model HY Payloader is at the rear, over the drive wheels, for maximum tractive effort and capacity, and the operator is up where he has a clear view in all directions.

Like company's other Payloaders, this easily steered model has automatic bucket tip-back to prevent spillage. It also offers hydraulic power control of bucket dump and close. It has full-reversing transmission, four speeds in each direction to 29 mph, and an independent quick-acting reverse control. Digging angle or bucket pitch is adjustable. Maximum dumping clearance is over 8 ft, enabling Model HY to heap-load big trucks. The Frank G. Hough Co., 866 Seventh St., Libertyville, Ill.

FLOW REGULATING VALVES

For steam, water at high pressure drops, flashing condensate

Uses for the new Type V10 Valves include drainage for stage heaters, evaporator coils, flash tanks, process systems, subcooled heaters, boiler blowdown, feed pump recirculation and other severe service conditions where high velocity impingement causes frequent maintenance or complete valve replacement.

All internal parts of the V10—seat, disc and long guide sleeve —are stainless steel, heat treated and precision ground. Valve design, with scroll inlet and gradually expanded straight outlet, is intended to eliminate direct impingement and resulting corrosion-erosion effects.

Valves are supplied in seven pipe sizes from 1 to 4 in., in 150 to 600 psi standards; 900-1500 and 2500 psi standards also available. The Swartwout Co., 18511 Euclid Ave., Cleveland 12, O.

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CHEMICALS in Quebec
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WOOD FLOUR in Maine
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Preferred —because of:

In a recent nation-wide industrial survey over half of those interviewed gave GARLOCK as their first choice for packings and gaskets. The main factors influencing their choice are listed at the right.

Illustrated above are a few widely used Garlock products: **A.** Garlock 950 Gaskets, cut from Compressed Asbestos Sheet; **B.** Garlock 150 High Pressure Packing; **C.** Garlock 731 Lattice-Braid Coil Packing; **D.** Garlock 430 *Chevron** Packing; **E.** Garlock *Bitan** Leather Cups; **F.** Garlock 875 Gas Compressor Metal Packing—all of uniform high quality for *dependable* performance.

*Reg. U. S. Pat. Off.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

1. Research

Garlock research brings improved products to meet changing needs.

2. Quality

High quality is assured by quality-controlled construction throughout.

3. Service

Helpful service calls by Garlock representatives and complete factory co-operation.

4. Complete Line

There are Garlock products for every kind and type of service.

5. Long Life

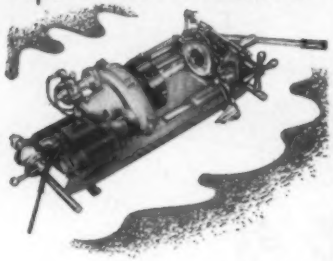
Garlock products give long, dependable service because of their uniform fine quality.

GARLOCK

PACKINGS, GASKETS AND OIL SEALS

• LIGHTWEIGHT
• LOW-PRICED
• EASY-TO-MOVE

the New Beaver Model-E Pipe and Bolt Machine



The new low-priced, lightweight Beaver Model "E" is a "junior edition" of the heavy-duty Beaver Model A—which has, for the past 20 years, been the recognized leader in the field of portable pipe and bolt machines.

The Model "E" uses the same dieheads—the same dies—the same patented interchangeable wheel-and-roller or knife cutoff devices—the same reamer arm and cone—as the Models A and B. This will be a great advantage to thousands of shops now equipped with the Beaver Model A or B because it eliminates the necessity of carrying in stock duplicate dies and parts—thereby preventing endless confusion and needless expense. And remember, there are 195 different kinds and sizes of dies instantly available for Models A, B or E.

Although designed primarily for hardware stores and small piping contractors, BIG contractors will find the new Model "E" useful on jobs requiring extreme portability.

A pipe machine is no better than the service back of it and our 50 years of experience in this field, and our reputation for high quality and friendly service, is your best guarantee of complete satisfaction.

WRITE FOR BULLETIN E

BEAVER PIPE TOOLS

210-300 DANA AVE. • WARREN, OHIO, U. S. A.

DATA FILE

of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to aid plant engineers in maintaining a permanent, up-to-date data file. For copies of these, write the number preceding the desired bulletin on the card in the heavy insert, pages 29-30 and 95-96.

PIPING, TRAPS, FITTINGS

201 How to Cut Steam Costs — Bulletin 250 tells how a differential drainage and boiler return system reduces steam costs. Layout drawings of installations included. Stickle Steam Specialties Co.

202 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculations, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

203 How to Choose and Use Air Traps—Bulletin 202 describes air trap selection and installation for automatic drainage of moisture from compressed air intercoolers, aftercoolers, receivers, separators and drip points. Armstrong Machine Works.

204 Steam, Air, and Gasoline Traps — Illustrated Catalog 250 describes several types of thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, piston-operated steam traps, also steam, air and gas separators. Includes capacity tables, installation diagrams. W. H. Nicholson & Co.

205 Strainers and Separators — Bulletin R-46-50A is a 16-pp catalog on T-type strainers, suction strainers, multi-flow and receiver separators. Contains dimensions, weights, prices. Shows how several types have been redesigned for increased efficiency. American District Steam Co.

206 Steam Trap Manual — "Solving Steam Trap Problems," 36 pp. covers correct trapping practice for unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains, header drips. Tells how to select size, determine lift of trap. Describes simplified piping for traps. The V. D. Anderson Co.

207 Handbook on Fittings, Flanges—Catalog wf-1950, 88 pp. offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

208 Unions and Fittings — Twelve-pp Catalog 50 covers manufacturer's line of unions of all types, elbows, tees and fittings. Describes special construction features. E. M. Dart Mfg. Co

209 Welding Fittings and Flanges—Catalog and Engineering Data Book 211, a 262-pp manual, provides complete dimensional data, weights and prices on company's welding fittings and flanges. Engineering section contains practical information on performance under varying conditions of temperature and pressure, location and materials processed. Technical section covers properties and rating of pipe, fittings and flanges, line expansion and flexibility, support and anchorage of piping. Tube Turns, Inc.

210 Small Pipe Markers — Bulletin 144 describes and illustrates, in color, self-adhesive pipe markers for identifying small diameter pipe and conduit, from ¼ to 2 in. dia. Description also covers markers for larger pipe and conduit. Sample marker included. W. H. Brady Co.

VALVES

211 Air Control Valve Data — A knob-operated air control valve with die cast body, for air, water, or oil service, pressures to 175 psi, temperatures to 125 F is described in this single-sheet bulletin. Dimensions, mounting data. Valvair Corp.

212 Bonnet Valves—"Pressure-Seal" bonnet valves are described in Form AD-1819. Includes sizes, ratings, and tests for gate, globe, angle and stop check valves for high pressure and temperature service. Tells operating advantages, how seal is made. Crane Co.

213 Reducing Valve Engineering Data—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straight-line flow, tight closing. A. W. Cash Co.

214 Blow-off Valves — Illustrated Bulletin B-433, 24 pp, describes blow-off valves for high-pressure boilers, and covers seatless, hard-seat and unit-tandem types, for working steam pressures from 400 to 2500 lb. Construction details and operating principles illustrated, dimensions, specifications included. Yarnall-Waring Co.

215 Valve Maintenance Guide — "Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

PUMPS, COMPRESSORS

216 Centrifugal Pump Care — Sixteen-pp Bulletin 06X6256A is a handbook on the care of all makes of centrifugal pumps. Tells how to figure head, determine friction loss. Discusses causes of troubles and their cures, includes maintenance time table. Tells how to prevent cavitation, common mistakes in packing stuffing boxes. Allis-Chalmers Mfg. Co.

217 Centrifugal Pumps — Single- and two-stage pumps for small boiler feed service, cooling tower service, bottle washing, brine circulation, general water service, hot well service are described in Bulletin W-306-B1. Includes ratings. Worthington Pump and Machinery Corp.

218 Technical Papers on Compressors — Centrifugal and axial compressors, their applications and methods of drive are discussed in 32-pp Form CH-49. Covers high pressure centrifugal compressor applications, commercial applications of centrifugal compressors and the complementary axial, centrifugal compressors for pipeline duty. Clark Bros. Co., Inc.

219 How to Solve Pumping Problems — Form 3060 is a 130-pp manual on selection, use of pumps. Tells type of pump construction best suited for handling 150 liquids. Explains how to determine size, compute suction list and discharge head, determine direction of rotation and size or speed of pulleys or gears. Gives instructions for installing rotary pumps, locating trouble. Geo. D. Roper Corp.

220 Pump Catalog — Turbine type and centrifugal pumps for industrial pumping jobs are described in this 12-pp booklet. Discusses features. Aurora Pump Co.

221 Rotary Pumps—The operating principle, advantages, construction features and range of applications of standard, heavy duty and special rotary pumps are explained in illustrated Bulletin 51-S, 8 pp. Includes dimensions. Viking Pump Co.

222 Centrifugal Pump—Bulletin 720.4, 8 pp, presents a single-stage, open-impeller type centrifugal pump, bronze fitted, designed for general water service, irrigation, circulation, slurries, transfer and factory wastes but applicable for other services. Shows how pump is constructed, gives specifications, bronze analysis, performance curves, dimensions. Goulds Pumps, Inc.

223 Centrifugal Pumps—Described and illustrated in Bulletin 50-9900 are a cross

section of an extensive line of centrifugal pumps. Includes heavy-duty Bilt-on pump, a pneumatic sponge pump, deep well and submersible pumps, also boiler feed, process, stuffingboxless, and sump pumps. Byron Jackson Co.

INSTRUMENTS, CONTROLS

224 Hydrometers for Industry—Bulletin G, 16 pp, presents hydrometers graduated in conventional scale ranges for routine testing, special and standard instruments. Gives ranges, intervals of graduation; density and volumetric tables. Precision Thermometer & Instrument Co.

225 Pressure Regulator—Bulletin 1-B, 8 pp, discusses design, operation and uses of a super-sensitive pressure regulator. Also covers a compound regulator for controlling back pressure relief valve and high pressure make-up valve. Atlas Valve Co.

226 Industrial Control Devices — Catalog 8303, 64 pp, presents 100 models of non-indicating electric, electronic, and pneumatic controllers for flow, pressure liquid level and humidity applications. New instruments shown, include electronic temperature controllers. Illustrated, includes engineering data. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

227 Time Saving Volt-Ammeter—Manual 110, 16 pp, "How to Make Your Job Easier with the Amprobe," describes the handiness of this pocket-size volt-ammeter in installing, repairing, servicing and maintenance of electrical equipment. Also tells some of the jobs on which this lightweight instrument can save time and trouble. Pyramid Instrument Corp.

228 Air Locks—Bulletin 8-31, 2 pp, describing air locks and trip master controls for holding regulating and control valves in position during failure of air supply, is illustrated with photos, diagrams, line drawings. The Swartwout Co.

229 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature, pressure, low water, liquid level, boilers; transformer-relays, control valves, mercury switches. The Mercoid Corp.

230 Water Temperature Control—How to regulate cooling water system of diesel and gasoline engines and air compressors with company's water temperature control is explained and illustrated in this bulletin. Two regulators and dial indicating thermometers are pictured, applications diagrammed. The Powers Regulator Co.

231 Moisture Meter—Bulletin 1263 explains construction, operation and advantages of an improved dielectric moisture meter for rapid, accurate moisture content determinations on granular, powdered or flaked materials. Taglialbue Instruments Div., Weston Electrical Instrument Corp.

232 Technical Data on Controls, Control Valves—Technical information and solution to problems involving pressure switches—or conversion of pressure or vacuum changes into electrical action. Data also on four-way solenoid valves for control of air, water and light oil in pipe sizes of ¼, ⅜, ½ and ¾ in., up to 150 psi. Barksdale Valves.

ELECTRICAL

233 Motor Handbook — Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Includes prices. Wagner Electric Corp.

234 Power Distribution Feeders — Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution system, gives construction, engineering, application data. The Trumbull Electric Mfg. Co.

235 Precision Switches—Twenty-pp Cat-

(Continued on page 124)

JEFFERSON
SAF-T-LAG
THERMAL FUSES

● Protect your panel boards, clips and switching equipment with cooler operating SAF-T-LAG Fuses. The SAF-T-LAG has an internal temperature 500° F. lower than ordinary fuses. Copper links replace the conventional zinc element making possible a cooler fuse and approximately 50% lower watt loss. The Jefferson balanced link design also guarantees equal heat dissipation with no hot spots.

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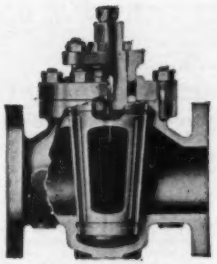
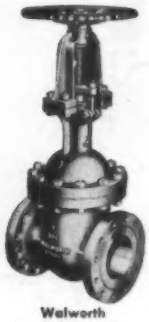
JEFFERSON ELECTRIC

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

• VALVES
• PIPE FITTINGS



Walworth
Lubricated Plug Valve



Walworth
Steel Gate Valve

Walworth
Iron Body Gate Valve

Walworth
"500 Brinell" Bronze Globe Valve

Walworth
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Walworth
Cast Steel Flanged Fittings

Walworth manufactures a *complete line* of valves and pipe fittings: all made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, Walworth products reflect more than a century of experience in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the *complete line* of Walworth steel, iron, and bronze, and special alloy valves and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

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DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

(Continued from page 20)

signed to offer more thorough lubrication and reduced maintenance. Explains principle of operation, describes special features, gives specifications and sizes. Also discusses use of this lubricator on various types of equipment. C. A. Norgren Co.

141 Hydraulic Grease Fittings—This new 14-pp 1951 Industrial Catalog illustrates and describes company's line of hydraulic grease fittings, couplers, swivel couplers, control handle for boosting grease pressures to 12,000 lb, and top oiler for upper cylinder lubrication. Includes helpful interchange chart on fittings. Universal Lubricating Systems, Inc.

INSTRUMENTS AND CONTROLS

142 Time Proportioning Relay—Illustrated Specification Sheet 185 describes manufacturer's Electr-O-Pulse Relay which provides time-proportioning control by variation of the on-off time ratio of a contacting device and has automatic reset. Discusses construction and operational details and features, also cycle time setting, approach rate, manual control. Dimensions included. Industrial Div., Minneapolis-Honeywell Regulator Co.

143 Electronic Indicator — Illustrated Pamphlet 525/E, 6 pp, explains operation of an electronic device for measuring both static and rapidly alternating forces, pressures, distances, vibrations etc., and having wide application in diesel engines, gasoline engines and compressors, and pumps, as well as in measuring vibration and oscillation of machine parts, and of torsional oscillation on shafts. Examples of measurements are described and illustrated, specifications given. Accessories are also shown. Morgens Bang & Co.

144 Tachometers—Resonant reed tachometers for hand use or permanent mounting, which require no contact with moving parts, are described and illustrated in 16-pp Bulletin 31 complete with ranges and other ordering information. Also provided are specifications and aids for proper selection and application of various ranges, types. Price list included. James G. Biddle Co.

145 Liquid Density Meter—A new direct-reading instrument for measuring liquid density is described in 8-pp Bulletin W-2. Designed to eliminate errors caused by liquid and gas interface in many types of instruments, this meter uses a totally submerged, self-centering, chain-weighted plummet as its measuring element. The scale is read across a single reference line on the plummet. Complete specifications, performance characteristics, installation drawings included. Precision Thermometer and Instrument Co.

146 Feed Water Control—Recent developments in company's three-element feed water control are described in 16-pp Bulletin 105-C. Provides a straightforward, concise discussion of problems encountered in feed water control and explains how this air-operated three-element system helps solve them. Diagrams, cutaway views, typical chart records and photos of installations included. Bailey Meter Co.

147 Thermocouple and Pyrometer Accessories—A new edition of company's accessory catalog, 56-pp Bulletin P1238 lists many additional items and contains new data on proper application and use of thermocouples. Well illustrated, covers hundreds of supply items, including assembled thermocouples, thermocouple wires, extension wires, protection tubes, insulators and accessories for the full range of industrial pyrometer applications. New technical information and installation sketches have been added to "Users' Manual" section which contains engineering data on modern practices in pyrometry. Also included are tables of calibration data for commonly-used base metal and rare metal thermocouples. The Bristol Co.

148 For Quick Current Measurements—Illustrated Form TT-5025 is a revised 8-pp bulletin covering manufacturer's Tong Test ammeters which can be used for measuring current in both a-c and d-c lines. Tells what these lightweight, low priced ammeters can do and discusses their features. Actual size illustrations show typical scale ranges. Gives information on standard ranges and how to select an instrument, also discusses range lowering and tests with high voltage circuits. Includes prices. Columbia Electric Mfg. Co.

149 Ground Testing Instruments—Comprehensive Bulletin 25 offers 20 pp of noteworthy information on Megger ground testing instruments for measuring resistance of earth to ground connections and for measuring earth resistivity. Aids to selection, application, typical tests, drawings and illustrations help to make this a valuable aid for those concerned with grounding surveys, electrical power and communication grounding, electrolysis and cathodic protection. Also describes company's new CVM tester, an easily used moderately priced instrument with ranges from 0 to 300 ohms. James G. Biddle Co.

150 Little Moisture Meter—A midget meter for instantly determining moisture content of wood, lumber, plaster and wood products, is described in 6-pp Bulletin 1295. Described as fast, accurate and self-contained, this meter measures moisture by electrical resistance method. Readings are taken directly at the touch of a button in per cent moisture. Its design and construction are explained and its use in testing woodwork, plaster in walls and ceilings shown. Tagliabue Instruments Div., Weston Electrical Instrument Corp.

151 Manual on Watthour Meters—A comprehensive presentation of the fundamentals of alternating-current metering, 40-pp Bulletin GET-1240 is fully illustrated with charts, diagrams and photos. Shows how electric energy is measured; describes operating principles of a-c watthour meters; and explains the techniques involved in their use, testing and maintenance. A compendium of information on a-c metering, the brochure can be used as a reference for the plant engineer, or as an aid in teaching proper application and maintenance of a-c watthour meters. Meter and Instrument Divs., General Electric Co.

TOOLS, WELDING, MACHINE SHOP EQUIPMENT

152 Manual on Carbide Tools—Extremely informative and useful, 60-pp Catalog GT-250, on carbide tools and parts, covers all data in company's former tool catalogs and supplements as well as many new items. Not only lists tools; it tells how to select and use them. Differences and even limitations in the various grades of carbide are clarified, not only for tool grades but also for wear-resistant grades, making it easy to select grade for practically any application. Discusses non-tool uses for carbide—tubing, shaped lengths, solid guide bushings, check valve seats, slotted guide rings. Full color illustrations are used profusely and there's a pictorial index. Technical literature offered by company is also listed. Carboloy Co., Inc.

153 Speedy Portable Saw—Illustrated Form 713, 2 pp, describes an air-cooled portable power saw which does hundreds of cutting jobs in wood and metal and other materials and needs no starting hole. Includes specifications, description of drills, blades and lubricant, also parts list. R.C.S. Tool Sales Corp.

154 Woodwork Tools—This 12-pp tool and attachment catalog covers equipment for use with company's line of cutting machines for woodworking, metal and plastics industries and includes several new items—a jig saw, lathe, belt sander, custom table top and safety saw blade. Illustrated with photos, includes ordering data. DeWalt Inc.

155 Condensed Data on Pipe Machines—Illustrated Form PM-150, a small folder, packs a wealth of factual information on manufacturer's portable pipe and bolt machines and covers a heavy duty model, utility model, and lightweight economy model as well as power drives, a pipe cutter and pipe threader for use with electric drives. Beaver Pipe Tools, Inc.

156 Resistance Welding—Vol. 17, No. 1 of Flashes, a house organ, presents a timely pictorial review of new and efficient production welding methods and equipment, including standard and special models. Lists dimensions, ratings and available literature on welders pictured. Thomson Electric Welder Co.

157 Hydraulic Resistance Unit — How company's Hydro-Check works to bring the smoothness of hydraulic operation to air-powered equipment is explained in Bulletin HC-900B, 8 pp. Photos show its use in hand milling, sawing, drilling and other applications. Includes dimensions. The Bellows Co.

158 Salvaging Machine Parts—Vol. 5, No. 6 of Metco News, a house organ, describes and illustrates some good metallizing salvage applications which represent considerable savings in cost of materials and production time and also saving of scarce metals. Tells the production metallizing setup to save defective motor blocks instituted by an automotive manufacturer, and the use of metallizing to maintain rolling stock by an express company. Metallizing Engineering Co., Inc.

159 For Tough Pulling Jobs—Illustrated Forms 100 and 101 show how manufacturer's heavy-duty portable hydraulic pulley pullers are built to solve tough pulling problems, reduce damage to equipment and save time and labor. Dimensions, prices, ordering information given for 5, 20 and 50 t capacity models. Industrial Engineering Equipment Co.

March, 1951
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160 Easier Machine Installation—Bulletin 415 describes low cost machine mountings that simplify machine installation, control vibration, reduce noise and absorb impact. Gives illustrated directions for installing pads, pictures their use with machinery. The MB Mfg. Co., Inc.

161 Coolant Filters—Self-cleaning filters for removing solid abrasives continuously and completely from coolant as it comes from the work are illustrated and discussed in this bulletin. Includes filter dimensions, lists other applications for these filters. Delpark Corp.

COMPRESSORS

162 Larger Portable Compressor—Form 2310 introduces company's Gyro-Flow 600 portable compressor, a new type of rotating vane compressor built to deliver 600 cfm free air at 100 psi and described as lightest weight unit (8500 lb) of its capacity range. Gives construction and design details, special features of the compressor, pictures its use in a wide range of jobs. Ingersoll-Rand Co.

163 What's New on Air Compressor Drives—Up-to-date information on motor drives for all types of large air compressors is supplied in the E-M Synchroniser No. 32. Included in this issue is application and selection data on both motors and controls for a variety of compressor types and sizes. Fully illustrated, this 24-pp house organ contains tables, charts and graphs for matching motor characteristics to compressor requirements. Also provided is a technical discussion of Fr. "synchronising power," methods of motor control for compressor installations and an article on the use of compressed air in the glass industry. Electric Machinery Mfg. Co.

COOLING

164 Dry Fan Cooling Towers—Catalog Section 48-1 describes and pictures an improved line of blower-type cooling towers, company's Dry-Fan 2-S series, offering 2 to 50 t refrigeration capacities. Explains how towers operate, discusses construction features and includes dimensions, specifications, typical temperature performance data. Also contains selection table for air conditioning and related applications. Binks Mfg. Co.

165 Spray Nozzle Systems—Recooling spray nozzle systems for use in plants operating condensers or using large quantities of water for cooling, are pictured and described in 8-pp Bulletin 6A-SP. It details design, application, construction, and operation of spray nozzles, and diagrams typical spray pond arrangements. Sizes, dimensions, capacities, and spray nozzle patterns are included. A temperature graph gives cooling performance curves for spray nozzles for various temperature ranges. Atmospheric conditions and operating pressures are discussed. Bulletin also presents louver screens. Schutte and Koerting Co.

ENGINES, GENERATORS, AUXILIARIES

166 Packaged Generators—The questions you ask about a packaged steam generator are answered in Bulletin SB-38 introducing company's new Keystone model. Photos and sketches show complete unit, pressure element and details of its compact design. Text covers special advantages of the two-drum water boiler, three-pass gas travel, automatic gas or oil burner and induced draft fan construction requiring no chimney. Dimensions and capacities listed, equipment described for this conservatively rated, fast steamer. Erie City Iron Works.

167 Two-Cycle Diesels—Catalog 6 SA-18, 36 pp in color, describing a complete line of two-cycle diesel engines for application in the industrial, petroleum and other fields, covers single and multiple engine units from 2 to 24 cylinders with power ranging from 32 continuous to 780 intermittent horsepower. Contains data on manufacturer's two-cycle design and interchangeability of parts; a power selection chart covering 57 standard power take-off and seven torque converter models; engine illustrations and an outline of service facilities. Detroit Diesel Engine Div., General Motors Corp.

168 Welded Steel Radiators — Catalog 1651, 4 pp, covers company's Mono-Weld radiators for heavy-duty gas, gasoline and diesel engine cooling. Shows design features and accessories for both one-piece and sectional-type cores—the former available in sizes capable of dissipating 70,000 to 800,000 Btu per hr under standard conditions and the larger sectional-type core units, from 960,000 to 2,250,000 Btu per hr. Young Radiator Co.

OTHER EQUIPMENT

169 Heat-Transfer Equipment — An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, aftercoolers, gas coolers, centrifugal pumps and water heaters. Many photos and sketches are used to show assemblies and construction details. Engineering and application data and instructions for installation, operation and maintenance are included. Bell & Gossett Co.

170 Ion-Exchange Conditioners—Water-conditioning equipment of the ion-exchange type is described in illustrated Bulletin A, 8 pp. Information covers softeners, hydrogen zeolite, de-ionisers, and company's newly developed mixed-bed deionizer, giving specifications on package-type units available for flow rates to 1000 gal per hr. Illinois Water Treatment Co.

171 Dust Control Technology—Detailed selection, operation, and maintenance data is contained in this 50 pp digest-size book, "Industrial Dust Control Through Exhaust Systems"—Illustrated, book treats exhaust hoods, piping systems; dust collecting equipment; exhausters and drives.

Introductory chapters list basic methods of dust control and analyze elements of exhaust systems. The part on hoods and piping systems discusses control of air movements, recommended hood and enclosure design, exhaust air velocity and volume and rules for installing system piping. Other sections provide information on types of collecting equipment, exhausters. Last chapter is devoted to operation and maintenance, giving methods for testing and evaluating exhaust system effectiveness, recommendations on periodic check-ups. Pangborn Corp.

173 Chemical Feed Systems—Not a sales catalog, this 12-pp booklet presents an informative technical article covering both dry and solution feeding, discussing the applications and potentialities of each. Illustrated by photos and drawings the text describes variations of the main types of feeding, explains advantages, limitations, equipment required. Proportioneers, Inc.

174 For Getting Around Easily—The Widgit, this manufacturer's answer to the problem of intra-plant personnel transportation, is described in a 6-pp folder. Standard and super models of this electric car are pictured, also a passenger trailer unit. Text explains how use of these cars pays for their cost in terms of time saved by executives and others whose work takes them throughout the plant. Price list included. Beall Mfg. Corp.

175 Combustion Control Case Histories—Here are five new bulletins each containing an illustrated report of a specific experience with combustion control and covering tobacco, rubber, paint and cement plants as well as a large commercial bakery. Each 6-pp booklet describes the problems facing the plant engineer before installing control, specific boiler conditions existing at the plant, how the control system operates, and results obtained with automatically controlled combustion. A selector guide, schematic drawing and photos are included. The Hays Corp.

176 Table on Tolerances—Data Card 115C is the latest edition of company's table on tolerances for round seamless carbon and alloy steel mechanical tubing, giving permissible variations in diameter and wall thickness. It refers to cold-drawn-unannealed and finished-annealed tubing in sizes to 7⅞ in. OD and to hot-finished tubing to 9¾ in. OD. The Babcock & Wilcox Tube Co.

177 To Stop Moisture Damage—Automatic dehumidifiers are described and illustrated in two bulletins. One covers a small unit designed for removal of 2 gal of moisture per day; the other covers a larger, three-channel continuous adsorption type unit for removing 14 to 55 gal per day in up to 25,000 cu ft of enclosed space. Operation of both models is explained and illustrated and specifications and performance data included. Dryomatic Corp.

178 Silicone Products—Form GC 2 is a 4-pp reference guide to company's silicone products. Arranged for easy use it describes briefly the various types of fluids, compounds, greases, resins and varnishes, rubbers and silicon chemicals. Lists literature available on each product. Dow Corning Corp.

180 Tape Is a Tool—The efficient use of industrial adhesive tape—widely used in sealing apertures, color coding, waterproofing over steam pipe insulation etc.—is discussed in this 28-pp handbook. Tells features of various types of backings and of calandered and spread adhesive masses, gives tips on storage, handling, and use of dispensers. Twelve taping problems from bundling to the taping of inside curves are explained and illustrated. An 8-pp insert folder gives a picture story of how tape is manufactured. Bauer & Black Div., The Kendall Co.

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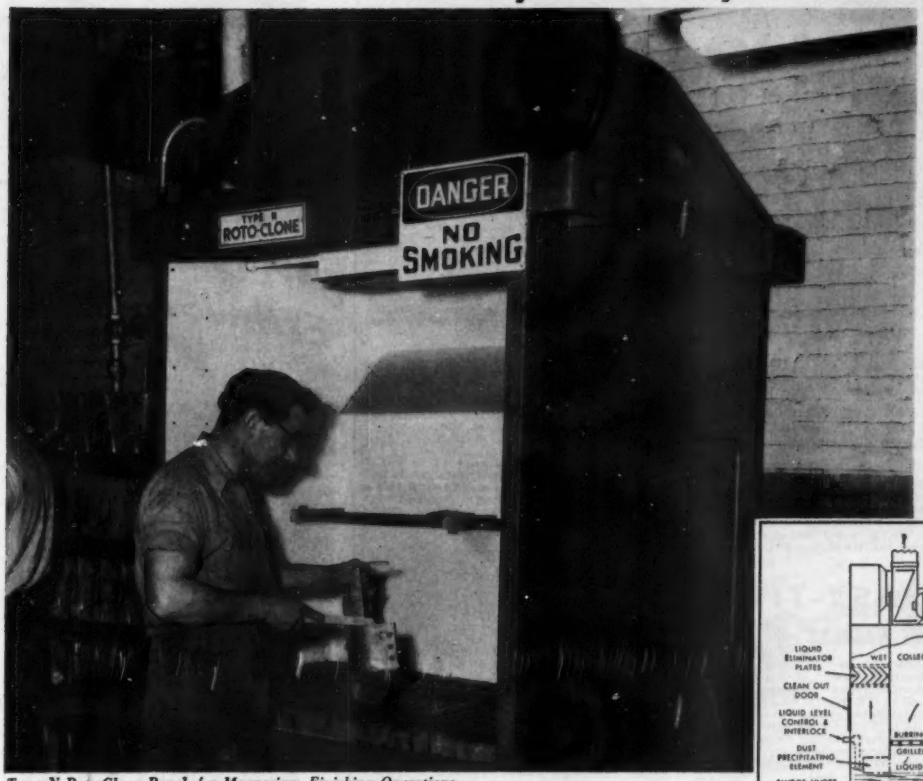
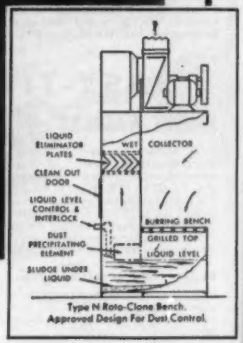


Type N Roto-Clone Bench for Magnesium Finishing Operations.
Dictaphone Corporation, Bridgeport, Connecticut



Type N Roto-Clone Bench.
Approved Design For Dust Control.

NO FEAR HERE...
of dangerous magnesium dust!

AAF Roto-Clone Type N Bench Eliminates Hazards Of Magnesium Finishing Operations.

The Type N Roto-Clone* dynamic precipitator has a remarkable safety record in efficient collection and safe storage of dangerous dust. Developed by AAF engineers for magnesium finishing, this unit or bench type wet-collector has no moving parts, pumps or nozzles, yet maintains the highest efficiency in collecting extreme fines.

The Type N Roto-Clone immediately removes incendiary dust from the source by passing entrained material through a sinuous water curtain under heavy turbulence . . . induced by the flow of air through a stationary impeller. Dust is stored at once in sludge form within the base of the self-contained unit, and under water for complete safety.

The eleven sizes and three arrangements of Type N meet requirements for all dangerous finishing operations, such as stand grinding, burring, buffing, sawing, etc. Unit design also provides additional safety factors by allowing isolation of operations.

If incendiary dust is one of your problems, call your nearby AAF representative or write for Engineering Bulletin No. 277 A.

**Roto-Clone, is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

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LIKE AN
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Just ONE 1/32" pin-hole size faucet LEAK
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of approximately 76,000 gallons
of water yearly—COSTING:
$10.13
@ $1 per M cubic feet

If a hot water faucet, then actual FUEL WASTED heating 76,000 gallons costs approximately:

$27.65 if coal (7,900 lbs.)
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STOP this needless WASTE during today's MATERIAL and MANPOWER shortages with 'SEXAUER' "Easy-Tites" that outwear ordinary faucet washers 6-to-1, thus SAVING labor on 5 REPEAT repairs, PLUS water and fuel, while prolonging the life of SCARCE fixtures.

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FAUCET WASHERS

...a modern laboratory triumph, are compounded from du PONT NEOPRENE instead of rubber—to withstand DESTRUCTIVE HEAT common in present-day super-heating water systems—that formerly broke down washer's structure (tested to withstand 300°F.).

Built like a tire with fabric re-inforcement they resist the grinding, closing squeeze that SPLIT and MUSH ordinary washers out of shape...causing LEAKS.

Through combining NEOPRENE and FABRIC RE-INFORCEMENT they OUTWEAR ordinary washers 6-to-1 on hot or cold TAPS—thus you slash water fuel and labor costs.

THE NEW 'SEXAUER' CATALOG

Edition F, just out pictures over 2500 TRIPLE-WEAR plumbing REPAIR parts and Pat'd. Precision Tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVT. AGENCIES that rely on SEXAUER repair materials. *Send for your copy today!*

Then too, there's a SEXAUER TECHNICIAN within quick call from coast-to-coast, who offers a special SURVEY service that sets up a schedule of the exact replacement parts required for your particular plumbing fixture regardless of make or age and *without obligation.*

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WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

as advertised in THE SATURDAY EVENING POST

(Continued from page 119)

alog 81 covers industrial switches for a-c circuits. Describes general purpose basic switches, auxiliary actuators, enclosed, explosion-proof and splash-proof types, limit switches, small switches. Includes technical data, prices. Micro Switch.

236 Electric Motor Lubrication Studies—Bulletin 1579 shows comparative amounts of lubricant in different designs of bearings and how bearings are subject to air circulation. Application of company's Lubriflush principle is presented. U. S. Electrical Motors, Inc.

237 The Why of Dry Type Transformers—Booklet B-4428, 24 pp, discusses reasons why dry-type transformers are safer and less expensive to install and maintain in industrial plants and utilities. Types of air-cooled transformers for every use are illustrated from small ones to power centers of 10,000 kva. Also describes sealed, submersible, dry-type transformers for installation underground. Westinghouse Electric Corp.

238 Small Bus Duct—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also strap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

239 Selector Switch Data — This folder of engineering information includes target sheet to aid in understanding company's push-pull selector switch. Features explanation on how switch provides single master control serving up to 16 operations. The Arrow-Hart & Hegeman Electric Co.

241 Distribution Duct Engineering Data—Bulletin 427-4 contains 32 pp of data for estimating ventilated duct for feeder circuits, plug-in duct, and plug-in duct for branch circuits. Includes instructions for laying out distribution duct jobs, and pointers on estimating, diagrams, layout symbols. BullDog Electric Products Co.

242 Plug-In Power — Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Includes specifications, mounting data, installation procedure. Feedrail Corp.

243 Power Circuit Transformers — Bulletin 501-15, 12 pp, gives descriptive information on auto and double wound dry type power circuit transformers. Includes tips on converting, isolating service, selection, also wiring diagrams, dimensions. Jefferson Electric Co.

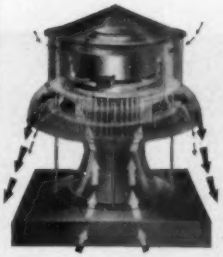
244 Power Distribution Cable — Bulletin RR-1 describes an economical multi-purpose cable offering super-aging, heat and moisture resistant insulation, Neoprene sheath. Illustrates construction. Rome Cable Corp.

MECHANICAL POWER TRANSMISSION

245 Chain Drive Manual—Catalog SCE-50, 68 pp, on chain drives, cites advantages and recommends applications. Gives information on chain length calculations, installation and maintenance, ratings, chain types, pitch and sprockets. Includes prices. Whitney Chain & Mfg. Co.

246 Steel Shaft Data — Bulletin G-7, 20 pp, contains formulas, curves and tables for determining proportions, stresses, combined torsional and bending loads in round, square, hollow, keyway and stepped shafts. IMO-DeLaval Products Div., DeLaval Steam Turbine Co.

247 Brakes and Brake Motors—Construction advantages of company's brakes are featured in illustrated Bulletin SL-610-1 on brakes and brake motors. Explains how brake works and the greater wear resistance afforded by bonded metal brake linings. Dimensions of brakes, mechanical and electrical characteristics and mounting data included. Crocker-Wheeler Div., Elliott Co.



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SAFELY EXHAUST FUMES, and MOISTURE

Gallaher Air-Van Power Exhausters are the answer to economical handling of moisture and fumes. Motor is out of airstream. In addition patented hood ventilation system draws fresh air under negative pressure downward thru motor shaft to form a positive air seal-off. Unit has built-in scroll effect for performance against normal static pressures. Direct connected. Fully weatherproof umbrella outlet. Heaviest construction throughout.

Tested and Certified by an Independent Laboratory.

Capacities 150-12,000 CFM; Static Pressures to 1¾".

See your Gallaher representative or write The Gallaher Co., Dept. P, 4108 Dodge St., Omaha, for full informational catalog.

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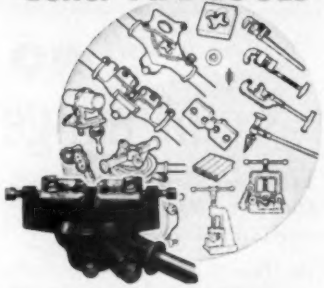
ARMSTRONG BROS.
Better PIPE TOOLS



Reversible Ratchet STOCKS and Adjustable DIES

Exceptionally convenient where space is limited, this stock simplifies pipe threading close to walls, in corners and wherever operating room is restricted. With *adjustable* dies (cut exact, over or under size threads) it is an ideal tool where valves and fittings are being installed or maintained.

"ARMSTRONG BROS." Adjustable dies are of special Vanadium Tool Steel, have "backed-off" teeth, correct cutting angle, ample chip clearance and correct throat angle. They start and cut easily, hold their sharpness and "spin" off pipe without jamming or tearing threads.

Write for Catalog

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"The Tool Holder People"
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248 Longer Life for Bearings — Bulletin 57B describes an economical three-step metallizing process which provides hard, oil holding surfaces for new and worn bearings. Metallizing Engineering Co., Inc.

249 Manual on Power Transmission Machinery — Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering, selection, ordering information; includes formulas, installation photos. Dodge Mfg. Corp.

250 Power Drive Handbook — Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

251 Hydraulic Couplings — Bulletin 3924 is a 24-pp collection of advertisements on use of hydraulic couplings in power plants. Feature on-the-job interviews and show increased plant efficiency afforded by use of fluid drives. American Blower Corp.

252 Handbook on Chains and Sprockets —An excellent reference book is 216-pp Catalog A418. Discusses various chains and their service applications, metals used in them, and factors affecting their efficiency. Gives selection information on chains for drives and for elevators and conveyors. Engineering data includes dimensions, strengths and weights on a wide range of chains, sprockets and attachments. The Jeffrey Mfg. Co.

253 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Includes photos and drawings and detailed information showing how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

MATERIALS HANDLING

254 Single Drum Hoist—Sixteen-pp Bulletin 76-X describes single-drum, portable multi-purpose hoists for industrial plants, construction work. Gives specifications for hoists with capacities from 500 to 3500 lb and driven by company's Turbinaire, Pistonaire, electric or gasoline engines. Selection chart included. Joy Mfg. Co.

255 For Efficient Overhead Handling — Bulletin C-1, 56 pp, pictures overhead equipment for practically all industries. Stresses construction, safety, electrical advantages of trolleys, cranes, track and auxiliaries. The American MonoRail Co.

256 Handling Equipment Ordering Book —Ninety-pp Catalog 23 describes power trucks, power jacks, stackers, cranes, hand trucks, platforms, storage racks. Fully illustrated. Lewis-Shepard Products, Inc.

257 Manual on Electric Hoists — Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls; gives dimensions. American Engineering Co.

258 For Overhead Moving — This is a 12-pp booklet of engineering and application data on tramrail equipment, telling how it can improve plant's handling methods. Shows system's rail and arch design, switches, cranes and transfer bridges, hand-operated carriers, hoists, cranes, buckets, grabs. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

259 Handbook on Overhead Conveying Systems — Manual A-56 provides 200 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering and application data. Richards-Wilcox Mfg. Co.

260 Trucks, Casters, Wheels — Catalog 50, 64 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and

What Other Drive Gives You...
1. HIGH STARTING TORQUE
Smooth... positive... powerful — that describes a Duplex Steam Engine starting under full load. No clutch — no gear shift — no torque converter... just steady, continuous, direct power as your load comes up to speed — as slow or as fast as you require.
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3 SIMPLICITY, LONG LIFE
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Up to speed without a falter: This 300 hp. Troy Duplex Steam Engine brings a positive displacement blower up to speed smoothly, dependably, without jolts or surges. The constant torque characteristic of the engine is also ideally suited to this load.
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If your drive needs any or all of these five characteristics, the modern Troy Steam Engine is indicated. Send us your drive requirements and steam conditions, and our engineers will be glad to recommend the right type and size Troy engine to meet your needs.
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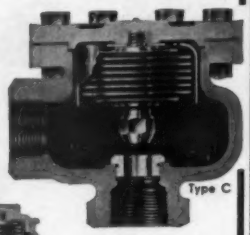
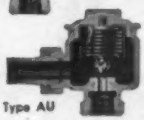
Nicholson Makes

Freeze-Proof Steam Traps

for Every Plant Use

Because they drain completely when cold, these four types of Nicholson steam traps are positively freeze-proof. Can be freely installed outdoors. Universally recommended for use in lines which need not be in continuous use during cold weather, because they are freeze-proof and because their 2 to 6 times average drainage capacity results in minimum heat-up time. The non-air binding feature of Nicholson traps also notably facilitates steam transfer in severe weather.





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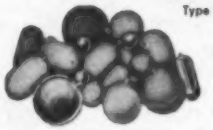

HIGH-PRESSURE FLOATS—Stainless, monel, steel or plated steel. Welded. In all sizes and shapes; for operating mechanisms and as tanks or vessels. 2-day delivery. BULLETIN 650.

W. H. NICHOLSON & CO., 208 Oregon St., Wilkes-Barre, Pa.

Durametallic Packing Wins Test Sealing 18 Solvents and Diluents

One of the nation's leading valve manufacturers recently conducted a thorough test on the corrosion resistant qualities of three leading brands of packing.

18 solvents and diluents were used in the test as follows: Butyl Acetate, Butyl Cellosolve, Cellosolve, Ethyl Acetate, Bensol Naphtha Med. Boil., Naphtha High Boil., Solvesso No. 2, Toluene, Xylol, Amyl Alcohol, Butyl Alcohol, Ethyl Alcohol, Isopropyl Alcohol, Methanol, Acetone, Methyl Ethyl Ketone and Methyl Isobutyl Ketone.

The packing that proved successful on this 90-day test, (having no leak or corrosion affecting operation), is indicated by the test engineer's report: "A valve suitable for handling solvents, diluents, paint and lacquer thinner should have the following stem packing—DURAMETALLIC NO. 777 NMT."

We will be glad to forward information on this or other types of Durametallic Packings for valve and pump requirements . . . simply write to the Durametallic Corporation, Kalamazoo, Michigan, for Bulletin No. PE-438.

wheel combinations. Thomas Truck & Caster Co.

261 Portable Hoists — This bulletin describes a lightweight air hoist in 2000, 1000, 500 and 300-lb capacities. Gives specifications, dimensions, operating advantages. Keller Tool Co.

262 Fastenings for Conveyor Belts — This collection of data covers hinged fastenings, repair plates, lacings, hooks, round belt couplings, also lacers, cutters. Gives instructions for use. Armstrong-Bray & Co.

263 Fast-Working Hoists — Bulletin W-815-B, 6 pp, provides electrical details on company's hoists — on wiring, brakes, motors and fast-operating, push-button controls. Standard, outrig, and multi-speed controls, limit switches are described. Shows unusual speed combinations available. Hoist and Crane Div., Robbins & Myers, Inc.

264 Specifications on Handling Equipment — Form TC-44, 8-pp, gives basic specifications on forklift trucks, both gas-powered and electric, on solid and pneumatic tires; industrial towing tractors; Tructractors for bulk materials, attachments. Industrial Truck Div., Clark Equipment Co.

265 Conveying Systems Manual—Unloading and conveying of dry pulverized material are discussed in 24-pp Bulletin FK-25. Text covers system and operation; stationary pump, accessories. Fuller Co.

266 Lifting Equipment—Bulletin 445 describes and illustrates hand-operated platform lifting devices in both light and heavy duty types, with capacities from 500 to 2000 lb. Economy Engineering Co.

267 Conveyor and Elevator Belts—This 28-pp collection of catalog sections illustrates parts used in construction of company's conveyor and elevator belts. Discusses features, increased service life and decreased maintenance. Covers cord, material, hot material, food handling conveyor belts, grain conveyor and elevator belts, industrial elevator belts. The B. F. Goodrich Co.

268 All-Around Bulk Handler—Literature is available on company's Dumpster, a truck-mounted carrying and dumping unit which does the work of several trucks by means of interchangeable containers. Shows how different containers handle a wide range of light and heavy bulk materials, solids, liquids, dusts, etc., which when placed in the containers stay there until dumped or set down intact. Dempster Bros.

CONSTRUCTION

269 Roofing Manual — Engineering data on roofing is given in Specifications 50, 30 pp. Covers coal tar pitch roofings, waterproofings, insulations, flashings, protective coatings. Includes illustrated instructions. Tar Products Div., Koppers Co., Inc.

270 Hard Boards of Many Uses — Illustrated 24-pp booklet on Presdwood discusses its adaptability and types for exterior and interior use, giving physical properties. Covers finish specifications, edge and surface cutting, bending and finishing. Masonite Corp.

271 Building Panel Engineering Data — This 40-pp reference book on use of steel and aluminum panels for walls, decks and roofs, discusses their use, advantages, methods of installation. Covers acoustically treated panels, fire resistance ratings, electrification, acoustic roofs, reinforcing floor forms. Fenestra Building Products Co.

272 Glass Block and Where to Use It—This 32-pp book gives design data, information on functional and decorative aspects of glass block. Covers properties, specifications, erection procedures. Insulux Div., American Structural Products Co.

273 Walkways and Loading Racks — Part I, Section 6 of Catalog 54, 36 pp, gives

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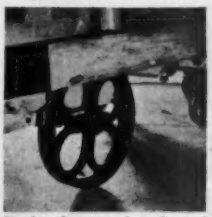

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application suggestions on pre-cut steel material for on-the-job erection into walkways, stairways, loading racks; instructions, layouts. Black, Sivalls and Bryson, Inc.

274 Technical Data on Plexiglas — This is a file folder of information on Plexiglas sheets, rods, molding powders, covering workability, properties, thicknesses. Discusses large area lighting. Rohm & Haas Co.

275 Let's Consider Aggregate — Bulletin 701 is an excellent 12-pp discussion of aggregate, telling what good aggregate consists of and giving recommendations for its use in producing good concrete. Illustrated throughout. Walter Maguire Co., Inc.

276 Building Construction and Maintenance Manual—Here's a 112-pp illustrated manual handy enough to rate carrying space in a plant engineer's pocket. It's packed with facts on concrete and wood floor treatments, paints and protective coatings, concrete and mortar admixtures, waterproofing and dampproofing, caulking compounds, and roof coatings. Indexed, estimating guides on floor treatments and roof coatings, brick requirements, timber requirements and water-cement ratios. L. Sonneborn Sons, Inc.

277 Overhead Door — This bulletin describes an improved overhead door which rolls up and back, above and away from doorway. Photos and sectional illustrations show how door is designed and constructed. Barber-Colman Co.

MAINTENANCE

278 Drip Preventive Handbook — Insulation of pipelines, tanks, cold air conditioning ducts and wall surfaces against corrosion and condensation drip is covered in pocket-size 32-pp Form F-17. Describes coatings, tells how to apply. Includes coverage tables. J. W. Mortell Co.

279 Painting with Aluminum — Form AD-223, 28 pp, tells how and where to use aluminum paints. Covers painting of metal, concrete and masonry and other nonabsorbent surfaces; of weather-exposed wood, and of interior heated surfaces. Aluminum Co. of America.

280 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

281 Adjustable Scaffolds — Lightweight, aluminum alloy scaffolds with adjustable legs and built-in safety factors are described in this bulletin. Shows how easily scaffolds are carried and erected. Up-Right Scaffolds Div., Up-Right, Inc.

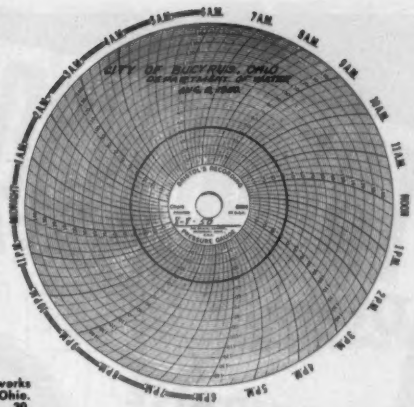
282 Insulation Protection — A long-term protective system for thermal insulation is described in Bulletin G-103. Shows how system works, how vinyl coating is applied and removed. Lists equipment for which it is recommended. Insul-Mastic Corp. of America.

283 Building Maintenance — Handbook 7, offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

284 Little Cleaner with Big Features — Construction and operating details on a small, portable vacuum cleaner with heavy-duty features of larger machine are given in Bulletin A-814. Air Appliance Div., U. S. Hoffman Machinery Corp.

285 Before Your Next Paint Job—Catalog F5136 offers plant engineers many a helpful hint on points to be considered before undertaking a paint job. Illustrated with photos and sketches, covers such factors as principles of contrast control and how to apply them, keeping costs down, exterior painting on various surfaces. Also contains a brief resume of company's paint products telling applications of each. The Tremco Mfg. Co.

How Bucyrus, Ohio, solved its pressure problem – with Stickle!



Installation: New, one-half million dollar water works plant, Bucyrus, Ohio (illustrated below). General Contractor, Richmond Construction Company, Mansfield, O. Consulting engineers, Floyd G. Browne and Associates, Marion, O. Daily capacity, 4,000,000 gallons of water, distributed through 35 miles of cast iron and wooden pipe lines.

Problem: How to assure safe, accurate pressure reduction, from 60 lbs. in cast iron lines to 40 lbs. in 45-lb.-capacity wooden lines serving city's industries.

Solution: Installation of 12" Stickle Remote Pilot Operated Pressure Reducing Valve. Chart, above, recorded during 24-hour period when fire hydrants were flushed all over town, shows how Stickle Valve held water pressure within 1-pound variation — around the clock.

(Below). New water works plant, Bucyrus, Ohio. Dedicated, August 30, 1950, by N. W. Section, American Water Works Association.

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286 What's Your Corrosion Problem?—This small folder on rust preventives for protection of metal surfaces presents both the oil film and petrolatum types, telling how each is used, giving recommended uses. Gulf Oil Corp., Gulf Refining Co.

287 Power Brushes—Bulletin C-269, describing company's new line of power brushes, contains photos showing their design and use. Complete ordering instructions and specifications are included. The Osborn Mfg. Co.

AIR CONDITIONING, VENTILATING

288 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

289 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

290 Heavy Duty Ventilation Filters—Form DPF-100. LH presents a dry-panel filter with a filtering area of 23 sq ft Tells features, uses; includes installation data, filter selection chart. Dollinger Corp.

291 Weatherproof Power Exhausters—Featured in this 8-pp bulletin are direct-drive exhausters so designed that the motor is out of the line of air flow to avoid damage by moisture and corrosive fumes. Typical applications are illustrated. Engineering data includes recommended average air changes, air velocities required for exhaust hoods, rating table, specifications, recommended uses. The Gallaher Co.

DUST CONTROL

292 Dust Collectors—Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk and Blum Mfg. Co.

293 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

294 Electric Blowers—Illustrated Bulletin 573 describes portable electric blowers in ½ to 1½ hp sizes for removing dust, dirt, grit and grindings from motors, bearings, gears. Breuer Electric Mfg. Co.

295 Vacuum of Many Jobs—Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

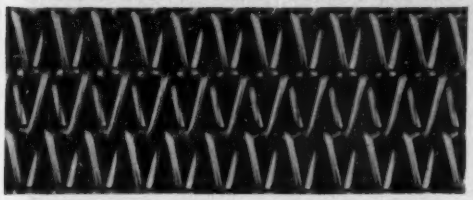
296 Dust Control Economy—Bulletin 909A, 28 pp, covers reasons for controlling industrial dusts and use of dust control equipment. Pangborn Corp.

297 Dust Recovery—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Explains what dust is and how company's equipment handles it, citing advantages. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency. Stresses flexibility of system, pictures applications. Buell Engineering Co., Inc.

WATER CONDITIONING

298 Zeolite Softeners for Small Plants—Publication 4505 describes junior industrial type zeolite softening equipment for plants requiring less than 100 gpm of softened water. Discusses single and double units, exchange materials. Cochrane Corp.

WISSCO BELTS



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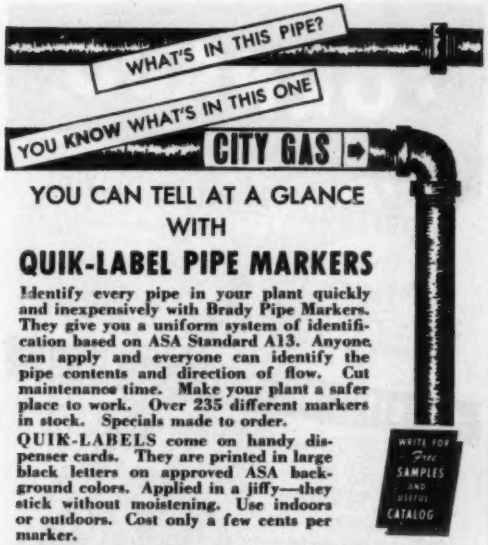

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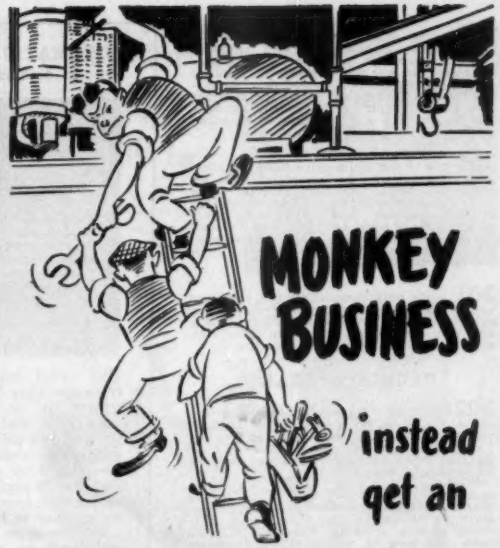

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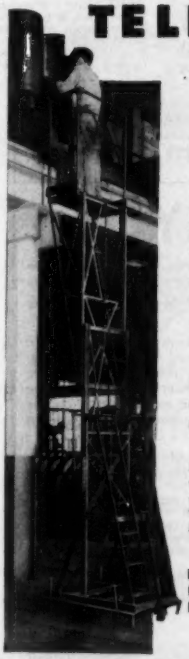

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299 **Boiler Water Treatment Methods**—File SM-9020 discusses ways of applying chemicals in water treatment. Covers pretreatment of raw water make-up, feeding equipment, constant rate and flow responsive feeding to feedwater systems and direct to boiler drum, flushing periods, condensate returns and condenser water, chemical tanks. % Proportioneers, Inc. %

300 **For Conductometric Determination of Solids**—A quick and simple method for determining solids content of boiler water or condensate is explained and illustrated in Bulletin 2RE50. Test procedure for boiler water utilizes conductivity meter in conjunction with a cell, dial thermometer, conductivity cylinder and reagent. Price list included. Hall Laboratories, Inc.

301 **Scale Formation**—This is a technical article on mechanics of scale formation, corrosion, other attacks on boiler metals, and how de-scaling unit works to correct, eliminate them. Butler Engineering Co.

PACKINGS, SEALS

302 **Data on Packings** — Form 428 is a collection of bulletins on flexible metallic packing, semi-metallic packing, rotary mechanical seal, oil pressure system and steel packing tools. Includes engineering data. Duramettallic Corp.

303 **Oil Seals and How to Use Them** — Bulletin PK-46A, a 16-pp handbook, provides photos showing where to use oil seals and how to install them. Drawings show how lip and heel construction of these non-metallic seals can be varied. Johns-Manville.

304 **Handbook on Mechanical Packings**—This 32-pp booklet describes mechanical packings, including a popular process packing which is self-forming, self-lubricating, self-sealing. Fully illustrated, provides ordering, application information and includes a packing recommendation chart. Packing Div., Flexrock Co.

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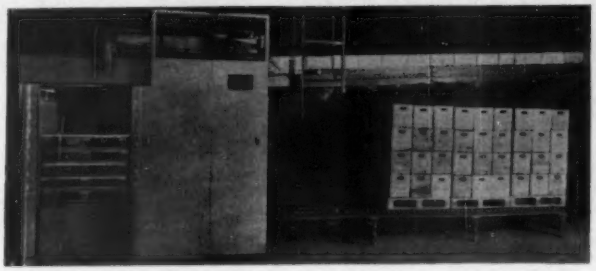
Is designed to supplement package handling conveyor systems



This pallet loader takes packages from conveyor line, stacks them automatically in predetermined arrangement and interlocking layers for a sturdy pallet load. Selection of package arrangement pattern is accomplished by push buttons and as many as 30 packages per minute can be handled, capacity being influenced by number of tiers per pallet.

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305 **Long Wearing Piston Packing** — Form 4502, 8 pp, stresses use of company's composition cups for packing the pistons of air and hydraulic cylinders and reciprocating pumps. Engineering information covers properties, textures available, temperature and pressure data, sizes. Darling Valve & Mfg. Co.

307 **Mechanical Seals for Rotary Shafts** —Illustrated with cutaway drawings, this 12-pp booklet covers seals of the positive,

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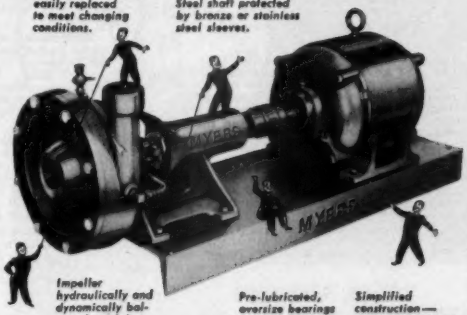
Casing and impeller easily replaced to meet changing conditions.

Steel shaft protected by bronze or stainless steel sleeves.



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Pre-lubricated, oversize bearings—extra durable.

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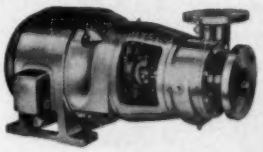

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chevron, and o-ring types, giving specifications. Shows typical applications. Also discusses special uses, installation of the seals. The Garlock Packing Co.

FUELS, LUBRICATION

308 The Why, What and How of Lubricants—This 20-pp booklet explains and illustrates common tests and terms describing lubricants. Covers viscosity, flash and fire, neutralization, number, penetration, specific gravity, extreme pressure, steam emulsion, corrosion. Tide Water Associated Oil Co.

309 Viscosity of Fluids—The larger significance of viscosity is discussed in Nos. 5 and 6, Vol. 36 of Lubrication, a technical publication. Illustrates simplest conception of streamline flow between two surfaces having relative motion. Shows how viscosity acts and may be measured. The Texas Co.

310 The Answers on Turbine Oil — This handy 2-pp booklet answers the questions: What causes deposits of sludge? What causes acidity increase? What causes corrosion in turbines? Explanations are brief, illustrated. Standard Oil Co. (Indiana)

311 Force Feed Lubricators—Catalog 25-E, 12 pp, describes and illustrates force feed lubricators for positive and automatic lubrication of cylinders and bearings. Stresses accessibility of enclosed working parts. Also discusses lubrication of compressors, industrial machinery. Includes prices. Manzel Div., Frontier Industries, Inc.

TOOLS, WELDING

312 Tool Catalog — Hand and power tools, tool sets, kits and related equipment are presented in 110-p Catalog T. Includes descriptive, ordering and application data. Snap-On Tools Corp.

313 Welding Electrode Ordering Guide—Pocket-size Catalog R7-7 on electrodes for hard surfacing and for welding stainless, alloy and mild steels, includes operating characteristics, current ranges, tensile strengths, polarity. Harnischfeger Corp.

314 Pipe Tools, All Kinds—Catalog 50, 36 pp, covers pipe tools, machines, power drives, threading oil. Products illustrated and operational advantages explained. Includes ordering specifications, price list. Beaver Pipe Tools, Inc.

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316 Dry Chemical Extinguishers — New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb. sizes are covered in Form C-104. Shows how this self-contained unit is designed, operated. C-O-TWO Fire Equipment Co.

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321 Fundamentals of Hydraulics—Technical Bulletin B-4 is a 44-pp guidebook covering essential information on hydraulic systems, maintenance, trouble-shooting and selection of proper fluids. Besides offering well-organized reference data for plant engineers, this book is suggested as a training manual for maintenance personnel. It features phantom and cutaway drawings illustrating functions of basic types of valves, pumps, hydraulic motors, torque converters and captioning shows the function of each component part. Sun Oil Co.

322 Plumbing and Heating Supplies—Edition F is a 118-pp catalog listing over 2500 repair parts and precision tools for maintenance of all types of plumbing fixtures. Fully illustrated, covers replacement parts used in faucets, shower mixing valves, toilet tanks, flush valves, and plumbing connections for basin and sink fixtures. Includes cleaning products for plumbing fixtures and boiler compounds. J. A. Sexauer Mfg. Co., Inc.

325 Vacuum Blasting — The efficiency and economy of vacuum blasting equipment for cleaning of equipment and other maintenance jobs, weld preparation, and conveying of granular material, is presented in this bulletin. A flow chart illustrates operation of a complete vacuum blasting unit-gun, generator, separator, dust collector. Vacu-Blast Co., Inc.

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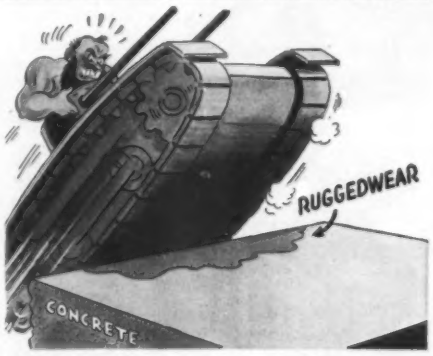

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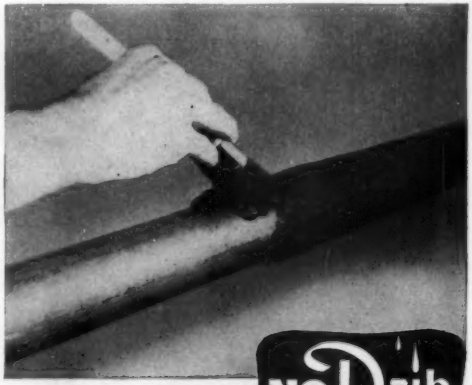

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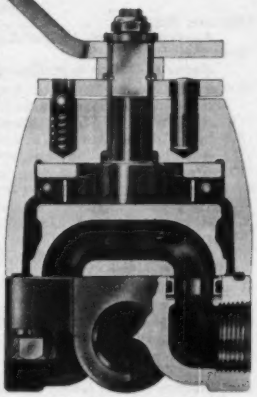

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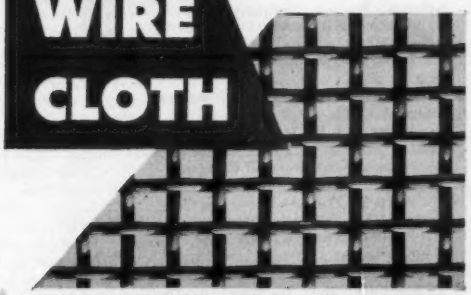

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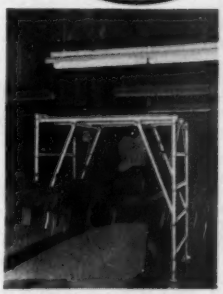

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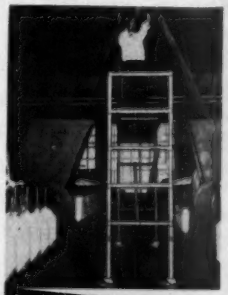

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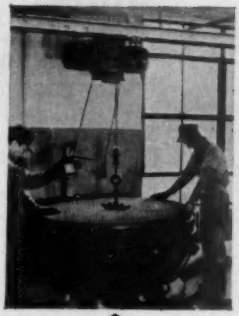

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'ROUND ABOUT

with the editors in field and office

(Continued from page 4)

cialized subject in a lucid and constructive manner. You will, incidentally, find out how little you know about your own specialized subject. This is a humbling experience through which all lecturers and writers pass."—*L. G. Northcroft.*

Industrial Buildings Architectural Contest

THE AMERICAN Institute of Architects has informed PLANT ENGINEERING of its annual competition to select "buildings worthy of recognition in certain classification." One of these classifications is Industrial Buildings. The building may have been erected anywhere in the United States or foreign country but must have been completed since January 1, 1946. Projects will not be judged in competition with other buildings but on the basis of the excellence of the solution of whatever problems were faced by the architect. Entries must be mailed before April 21.

Complete information on the contest may be obtained from the Institute at 1741 New York Ave., Washington 6, D.C.

Gripes and a Couple Aspirin For the Headache Department

RECENTLY, WE HAD a letter from a reader commenting on some of his difficulties and continuing "what causes me the most concern is having our engineering department and draftsmen in another city designing equipment for a plant they have never seen. In fact, some of them have never been in a steel plant."

Better coordination of department activities and decentralization of responsibility and authority have made complaints of this kind less common than in past years. It still remains a real and troublesome problem in some plants however and field correction is the cause of considerable wasted time, effort and money.

Probably, the best job in this direction is being done in the aircraft industry. Fairchild in designing the C119 was up against a tough production problem: small peace-time production capable of rapid expansion in an emergency. Administrative, engineering, production and plant engineering departments went to work on this problem as a team.

As a result of the close cooperation the engineering department evolved designs which would not create definite problems for tool design or production planning later on. The planning also involved production change-over from the old C82 to the new C119. By close coordination the change was made smoothly without interfering with production. Eventually, every department had a hand in the change-over, from the planning stage on to completion.

Another example of close cooperation is taken from an article to be published shortly. "Let's suppose," say the author, "that Boeing received a reorder for 20 commerical Stratocruisers today and is in a position to go into full scale production without the restrictions of the present national emergency. The first manufacturing step would be a conference called by the Vice President in Charge of Manufacturing in which he would outline contract terms to the six staff chiefs and discuss with them plans for getting work under way, establishment of schedules, etc.

"It is the head start that plant engineering and transportation departments get by being represented at this meeting equally with the office of the factory service manager, experimental manager, quality manager, factory superintendent and administrative assistant to the manufacturing vice-president that enables these two departments to begin their planning at an early date."

For Prospective Industrial Atomic Specialists

UNCLE SAM operates a school for training in nuclear reactor technology. The next course begins September 1, 1951, and the deadline for applications is April 1, 1951.

Category B students are selected from Government agencies and private industrial firms interested in participating in the AEC nuclear energy program.

Further information and application forms may be obtained from the Director, Oak Ridge School of Reactor Technology, Post Office Box P, Oak Ridge, Tennessee.

An Industrial Electrical Show for Los Angeles

THE ELECTRICAL Maintenance Engineers Association of Southern California with headquarters at 816 West Fifth Street, Los Angeles 17, California, is holding its Fifth Annual Industrial Electrical Show on March 15, 16, and 17 at Shrine Convention Hall, Los Angeles.

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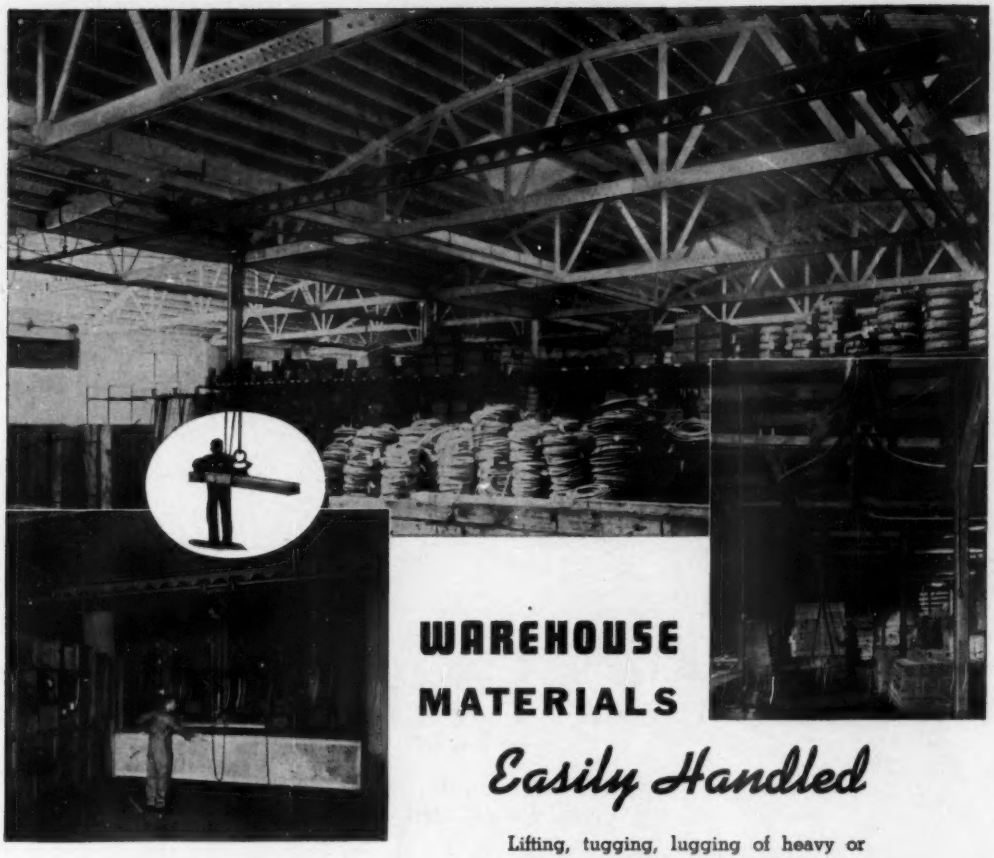

WAREHOUSE MATERIALS *Easily Handled*

Top Photo: Miscellaneous brass goods handled with a smooth-rolling long span hand-propelled crane.

Right Photo: Large piles of lumber are easily moved by one man with this overhead system.

Left Photo: This inexpensive crane makes the handling of long unwieldy boxes a simple matter.

Lifting, tugging, lugging of heavy or cumbersome warehouse materials not only is hard on the workers, but requires more help and time, and is a major factor affecting profits.

Cleveland Tramrail equipment of various types has been developed for nearly every warehouse requirement. This equipment makes it easy for one man to handle heavy boxes or awkward shapes and usually pays for itself in a short time.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
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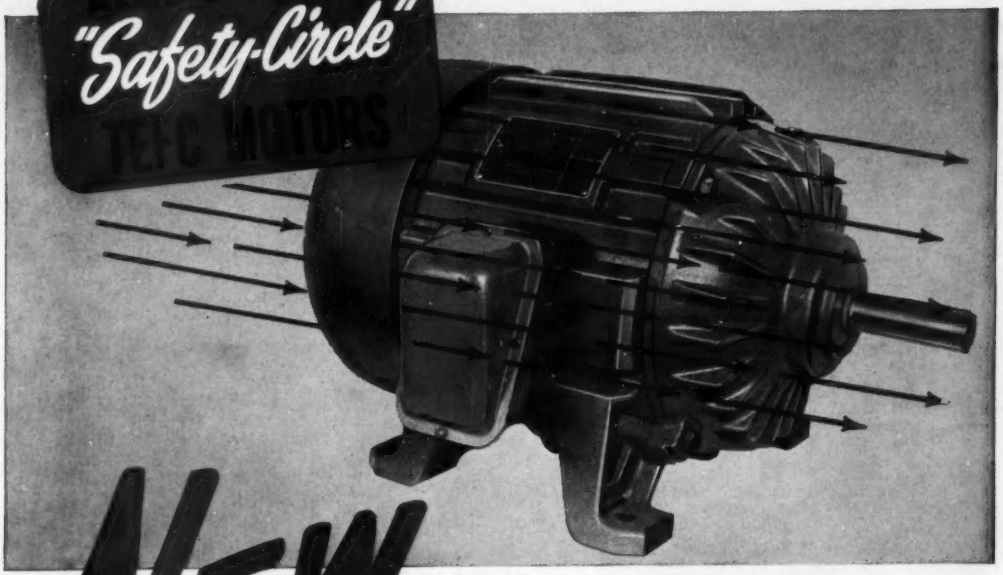
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



NEW Easy to Clean Resists Corrosion

CORROSIVE ATMOSPHERES CAN'T HURT this Allis-Chalmers totally enclosed, fan-cooled motor because major parts are enclosed in a rigid corrosion resistant cast iron frame! No extra treatment is needed and cast iron's corrosion resistance won't chip off.

Lower Maintenance, Too

No corners, pockets or hidden air passages to collect dirt. Cleaning is the simplest of maintenance operations. Just blow off the dirt with an air hose. Fan and housing design keep cooling airflow tight against the yoke so dirt does not accumulate and cleaning is seldom required.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. Extra rigidity of the cast iron frame holds bearings in true alignment under all operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Call your nearest Allis-Chalmers Authorized Dealer or Sales Office for complete information or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3228

Safety Circle, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

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TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

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